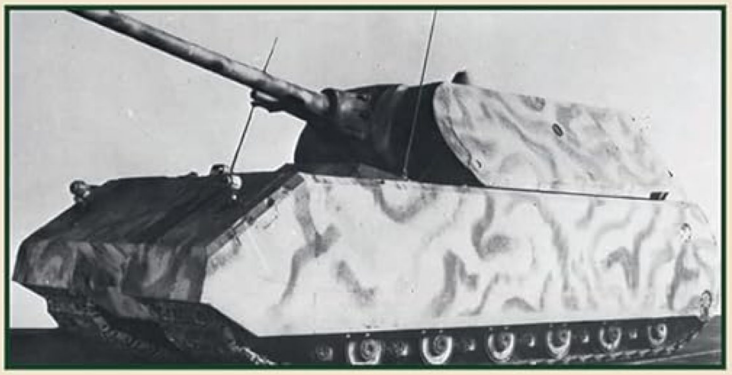
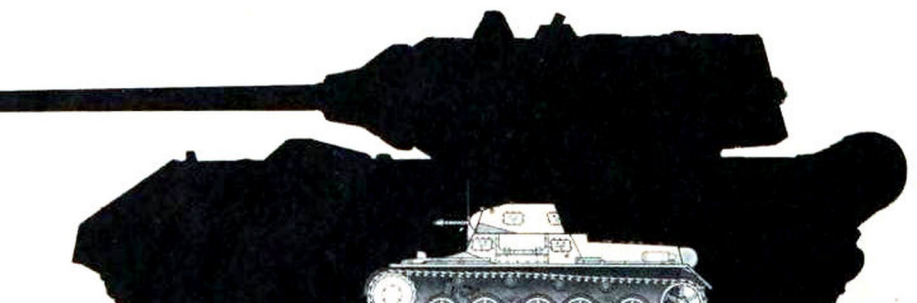


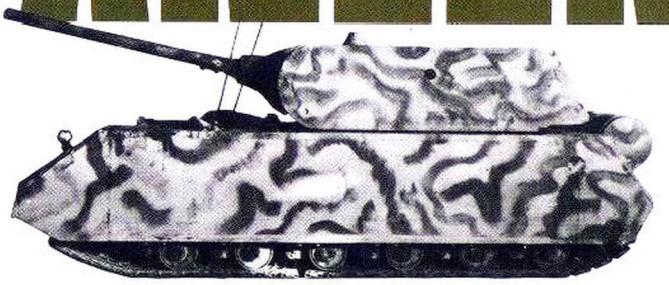
KAMPFPANZER MAUS

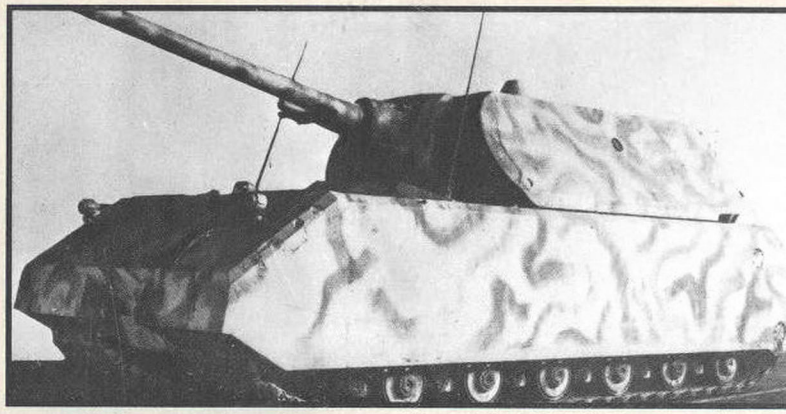
The Porsche Type 205 Super-Heavy Tank

Michael Fröhlich



KAMPFPANZER MAUS





KAMPFPANZER MAUS

The Porsche Type 205 Super-Heavy Tank

Schiffer Publishing Ltd.
4880 Lower Valley Road • Atglen, PA 19310

Michael Fröhlich

Copyright © 2017 by Schiffer Publishing

Originally published as *Kampfpanzer Maus* by Motorbuch, Germany © 2013 Motorbuch

Translated from the German by David Johnston

Library of Congress Control Number: 2016955716

All rights reserved. No part of this work may be reproduced or used in any form or by any means—graphic, electronic, or mechanical, including photocopying or information storage and retrieval systems—without written permission from the publisher.

The scanning, uploading, and distribution of this book or any part thereof via the Internet or any other means without the permission of the publisher is illegal and punishable by law. Please purchase only authorized editions and do not participate in or encourage the electronic piracy of copyrighted materials.

"Schiffer," "Schiffer Publishing, Ltd.," and the pen and inkwell logo are registered trademarks of Schiffer Publishing, Ltd.

Type set in Arial, Alternitive Gothic & American Typwriter
ISBN: 978-0-7643-5078-8
Printed in China

Published by Schiffer Publishing, Ltd.
4880 Lower Valley Road
Atglen, PA 19310
Phone: (610) 593-1777; Fax: (610) 593-2002
E-mail: Info@schifferbooks.com
Web: www.schifferbooks.com

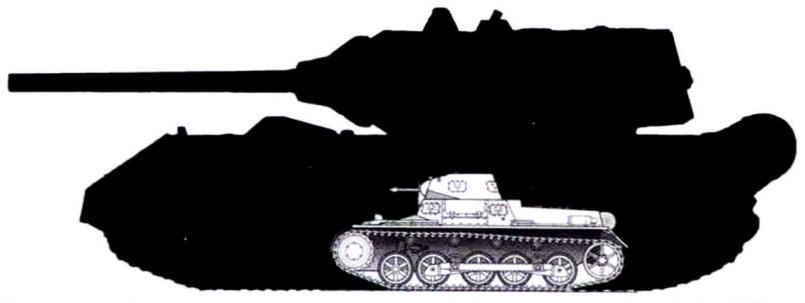
For our complete selection of fine books on this and related subjects, please visit our website at www.schifferbooks.com. You may also write for a free catalog.

Schiffer Publishing's titles are available at special discounts for bulk purchases for sales promotions or premiums. Special editions, including personalized covers, corporate imprints, and excerpts, can be created in large quantities for special needs. For more information, contact the publisher.

We are always looking for people to write books on new and related subjects. If you have an idea for a book, please contact us at proposals@schifferbooks.com.

Contents

Foreword 6
Introduction – The Big Tank until 1945 7
Development of the Type 205 – From Little Mouse to Mouse 14
The Concept of a Super-Heavy Tank 14
New Requirements Delay the Project 21
Production of the Mice 44
Construction under Adverse Conditions 44
Cancellation of Series Production 47
Maus 205/1 – The Turretless One 49
Initial Tests 49
Transport to Böblingen 53
Installation Work and Further Testing 63
Maus 205/2 – The Complete One 88
Assembly at Böblingen 88
Test Drives by 205/2 89
The Mice Are Blown Up 97
Maus 205/3-7 – The Uncompleted Ones 100
Maus 205/1+2 – The Russian One 104
Assembly and Removal of Maus 205/1+2 112
NIBT Proving Grounds Report 116
Indoors in the Museum 124
The Design and Testing Team 135
Technology in Detail 138
The Porsche Company's Wooden Model 140
The MB 509 Gasoline Engine and the Cooling System 143
The MB 517 Diesel Engine 148
The Drive 152
Other Tank Components 154
On the Trail of the Maus 161
Appendix 169
Preliminary Remarks 173
Description and Instruction Manual 178
Maus Turret Equipment and Operating Instructions 210
Maus Development Timeline 235
Bibliography 240
Photo Credits 240



Ten years of German tank development saw tanks increase in size from 5.4 to 189 tons.

Foreword

I had my first encounter with the subject of the Maus tank as a youth, when I discovered model making and decided to replicate the biggest tank in the world in wood. Back then I could find few books on the subject, and when the model was completed my interest in the Maus temporarily ended. After I came of age, I was able to read a number of books about heavy tanks in which the Maus was often mentioned. It was then I noticed that, while the tank's prehistory and structure were described in detail, there was scant information about the prototypes, their testing, and subsequent fate. The striking contradictions in the statements and details by almost all of the authors also made me curious, and I began exploring all the available media. After much consideration I decided to publish the results of my decades-long research into the two prototypes of the Porsche Type 205 tank—better known by its codename Maus—for even today there are still no publications dealing in detail with this tank.

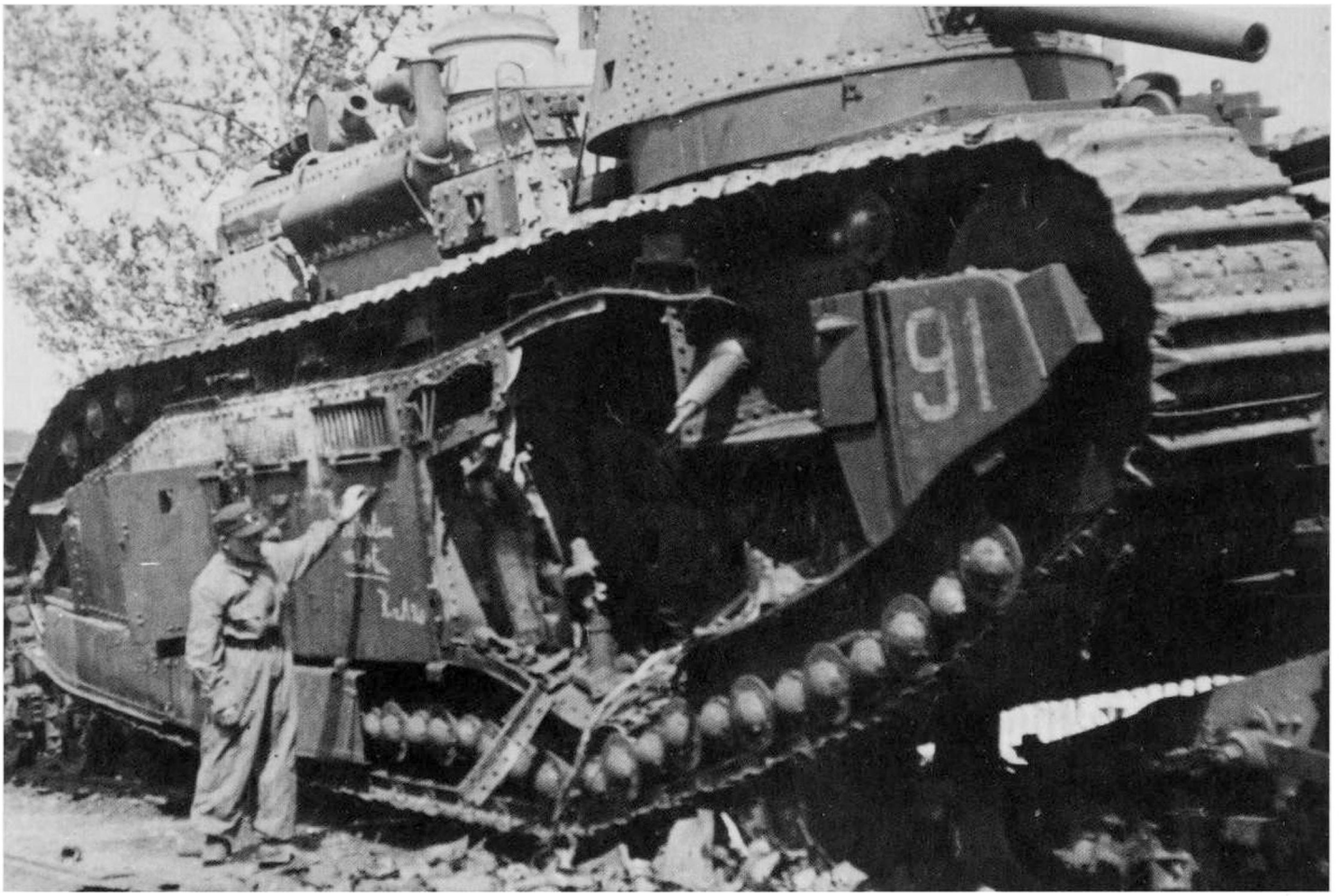
I also want to address the various errors and misinterpretations in other publications on this subject. My main objective is to make accessible to every reader all of the previously unseen drawings, photos, and descriptions.

I would like to offer my thanks to Wolfgang Fleischer of Freital, without whose help this book would not have been possible; to the Porsche Company of Stuttgart, especially Dieter Landenberger, for its outstanding support; to Dieter Gross of the Porsche Archive for his patient assistance; to Matthias Hausmann, Joachim Deppmeyer, and Heiner F. Duske for photos; to Michael Jung of the Mercedes-Benz Archive; to Martin Langford of Bovington Tank Museum; to the aerial photo bank of Dr. Carls of Estenfeld; to the Military Archive in Freiburg; and to my family. They have all made important contributions to this book.

Michael Fröhlich
Dresden, February 2013

Introduction
The Big Tank until 1945

The Maus (Mouse) tank, also called *Mäuschen* (Little Mouse) at the beginning of its development (the manufacturer's designation was Porsche Type 205 or *Sonderfahrzeug IV*), is often also referred to as the Panzer VIII or VK 100.1, even though no reference to these can be found anywhere. Curiously, this tank never officially received a VK number (Experimental Design + Weight + sequential number), even though prototypes were already under construction, so numbers were given for experimental designs that existed only on the drawing board. The designation VK 100.1 only appeared once at a meeting held by Krupp on April 18, 1942, when a turret with a 150 mm gun was supposed to be offered to Porsche for its VK 100.1. The name *Mammut* is also not correct, because it was only used during the predevelopment stage until 1942. The prototypes were later numbered sequentially: 205/1, 205/2, etc. Not only vehicles received these Porsche type numbers; for example, they were also given to power units, detail solutions, and other designs, including the Type 82 *Kübelwagen*, which was derived from the Porsche Type 60 Strength through Joy car (better known as the VW Beetle); its derivative, the Type 166 *Schwimmwagen*; and the Porsche Type 125 auxiliary generator power unit (half a VW engine) installed in the Panzer 205. With a weight of 189 tons, the Maus was a typical example of the effort to drive technical development ever further towards the limits of the possible. This was a step in the wrong direction, though, comparable to Neanderthal in human evolution. WWI saw the first projects for super-heavy tanks; it was the age of technical dominance. In 1916, Great Britain came up with the concept of the Flying Elephant, a heavy tank weighing 100 tons. It had the same dimensions as the existing Mark I, but was conceived as a "breakthrough tank" with armor thicknesses between 50 and 76 mm [1.96–2.99 in.]. The Flying Elephant had four tracks, but they were to be powered by just two engines, each producing 105 hp. Speed would have been minimal, causing the project to be abandoned. Like all the other warring states, Germany also came up with the idea of a breakthrough tank, but only Germany seriously undertook its development. In Kassel in March 1917, Germany conceived the *K-Wagen* (K = Kollossal), also called the *Großkampfwagen* (Large Fighting Vehicle). It was originally supposed to weigh 60 to 70 tons, but this was later increased to 140 to 150 tons. To save weight, the design's length was reduced. Ten were ordered. The tanks, which would have weighed 120 tons with two 650 hp engines, were never completed. Some idea of the tank's size can be garnered from the fact that each would have had a crew of twenty-seven and an armament consisting of four 77 mm guns, seven machine guns, and 600 rounds of ammunition (weight 5,480 kg [12,081 lb.]). The circumferential tracks left little interior space for the gun crews. It could only have been transported by rail when disassembled. Had its armor not been just 30 mm [1.18 in.] thick, one could have described it as a mobile bunker. The vehicle was 13 meters [42.6 ft.] long, 6 meters [19.6 ft.] wide, and could achieve a speed of 8 kph [5 mph]. The tank was to have broken down into six components for transport by rail. Of the two prototypes started by the Riebe Company of Berlin, one was almost complete and could have been tested. The Wegmann Company had another tank body almost complete. At the end of the war, the design had to be scrapped according to the provisions of the Treaty of Versailles. Other nations took similar paths. The Char 2C was designed in France in 1918, but it was not completed until 1922. At 68 tons, this tank was still a lightweight compared to the K-Wagen, but it was still 4 meters [13 ft.] high and had 45 mm [1.77 in.] of armor. A subsequent development in 1939 had 65 mm [2.56 in.] of armor, causing the vehicle's weight to rise to 75 tons. Three hundred of these tanks were ordered, but just ten were built after WWI. The tank had a 75 mm gun, four 8 mm machine guns, and a crew of twelve that fought on two levels. Drive was gasoline-electric. Two generators driven by Maybach 250 hp gasoline engines provided power to the two electric motors of the track drive. Maximum speed was just 15 kph [9.3 mph]. Fuel capacity was 1,260 liters [333 gal.] and gave a range of about 150 km [93 miles]. A special loading design was developed for rail transport, enabling the huge vehicle to fit the rail track profile. The tank was hung between three pivoting bogies. Just six tanks were still available in 1940. By WWII, they were obsolete and were used mainly for propaganda purposes. An attempt was made to evacuate the tanks by rail but the tracks were blocked. The tanks were destroyed and fell into German hands. A single Char 2 tank was repaired by the Germans



Test driver Behnisch of WaPrüf 6 in front of the Char 2c after it was blown up in Guys, in the south of France. Behnisch later tested the Maus at the army proving grounds in Kummersdorf-Gut.

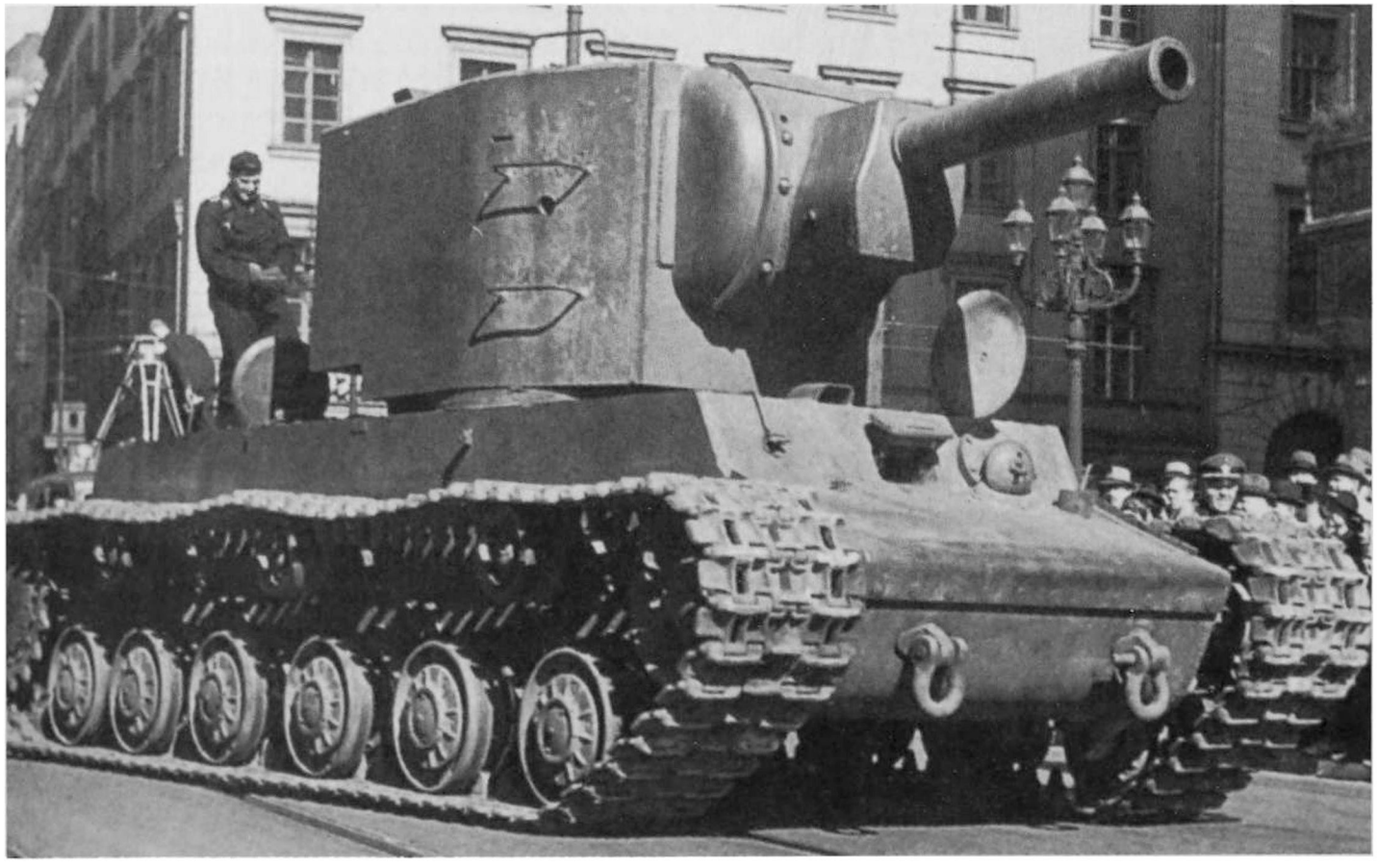
and extensively tested at the WaPrüf 6 testing grounds in Kummersdorf-Gut. Development of the Char F1 began in 1938 (in parallel with other heavy tank developments in France). It was supposed to replace the obsolete Char 2C and was designed primarily to overcome heavily defended German fortifications. This tank was supposed to weigh 139 tons and was to have been 10.5 meters [34.4 ft.] long and 4.2 meters [13.78 ft.] tall. Armor thickness was 100 mm [3.94 in.], and a crew of nine operated two revolving turrets, each mounting a 47 mm gun. Two 550 hp Renault V 12 engines were supposed to give the tank a speed of 20 kph [12.4 mph]. Power to weight ratio with a range of 200 km [124 miles] was claimed to be 7.9 hp/ton. An order for twelve Char F1 tanks was placed in 1940. A full-scale wooden model was completed, but France was occupied by Germany before completion of the twelve tanks ordered. Volume 6 of *Meyer's Lexicon*, which appeared in Leipzig in 1927, described a mobile fortress, a French Velpry tank weighing 600 tons. This experimental tank was to have 25 cm [9.84 in.] of naval armor, making it impervious to enemy fire. Unfortunately, all that is known is Velpry was a French general and armor expert who actively took part in the design of French tanks, such as the Renault fighter 17 and Char B1. In Russia, the 100-ton "Katayuscha's Fortress" and the 35-meter [114.8 ft.] long "Armored Land Cruiser" were projected in 1915 and the 197-ton "Armored Automobile" in 1916. They were supposed to pave the way through the stationary front held by the Kaiser's armies. In 1931, German engineer E. Grote (who more than ten years later, on June 23, 1942, was tasked by Hitler with development of the 1,000-ton Ratte heavy tank) worked out two variants of a 1,000-ton tank. In 1933, he designed the TG-5 giant tank. It had three or more turrets and was to have had a crew of forty. Armament consisted of one turret with two 304 mm guns, two turrets each mounting two 152 mm and four 76.2 mm guns, and one turret with two 450 mm anti-aircraft guns. Its engines produced 24,000 hp and were supposed to accelerate this behemoth to 60 kph [37 mph] with the help of a hydro-mechanical drive. The running gear consisted of two triple tracks. The design was rejected as too cumbersome and too complicated.

The search for a heavy breakthrough tank also resulted in the T 35 heavy tank, a derivative of the English A1E1 "land battleship" of 1923. It was supposed to penetrate heavily fortified positions and engage multiple targets simultaneously.

The Soviet KV II heavy tank.

Just under ten meters [32.8 ft.] long and 3.4 meters [11 ft.] high, it did not qualify as a super-heavy tank. The T 35 weighed 50 tons and was rather weakly armored, with a maximum frontal armor thickness of just 30 mm [1.18 in.]. It had one turret with a 76 mm howitzer, two turrets with 45 mm guns, and two more with 7.62 mm machine guns. The crew consisted of ten men. The tank's 500-hp M-17M engine gave it a maximum speed of 30 kph [18.64 mph]. Its main disadvantages were its lack of maneuverability, inadequate armor thickness, and troublesome steering system. The five turrets also got in each other's way in combat and fire direction was difficult for the commander. The vehicle's most impressive appearances were at military parades in Moscow. Against modern anti-tank weapons the T 35 stood no chance. One T 35 was tested at the army proving grounds in Kummersdorf-Gut. One example of the T 35 (61 were built) survives in the Russian tank museum in Kubinka. A derivative of the T 35 was the Soviet Union's 14-2 self-propelled gun, which mounted a 152mm L/47.2 gun and had a crew of seven. A single prototype was built and it also resides in Kubinka. As this tank was not a success, in 1938, the Russians developed the prototype T 100, a 58-ton tank with two turrets and a crew of seven. Armament consisted of one 76mm and one 45mm cannon, plus three machine guns. The 500-hp engine gave the tank a speed of 35 kph [21.75 mph]. Developed in parallel was the 55-ton SMK, which resembled the T 100, but was to become the forerunner of the KV I heavy tank that later achieved such success. In 1939, the prototype KV I saw action in the Finnish War as a "single-turret tank" (in some cases with twin cannon). During the Russo-Finnish War, the SMK was sent into action at Suma on December 17, 1939. It ran over a mine. While the track was repaired, the engine refused to start and the tank could not be recovered. In February 1940, it was finally recovered by six T 28 tanks and it was later scrapped in the 1950s. The tank's armament was found to be too weak, and with the T-100 Y, one final variant of the super-heavy breakthrough tank (actually a self-propelled gun) was created. It had a 100 mm naval cannon, plus three machine guns, and weighed 64 tons. Its intended role was against heavy bunkers. The T-100 Y was allegedly used during the Battle of Moscow in 1941. Today, this vehicle is also in the Russian tank museum in Kubinka. In April 1941, the Soviets decided on a project for a new super-heavy tank that was supposed to be capable of destroying all German heavy tanks. The result was the KV-4, which weighed about 90 tons, and the KV-5, with two turrets, a weight of 110 to 120 tons, and 120–150 mm [4.72–5.9 in.] of armor. The project was canceled in August 1941. The KV-5 would have been a dangerous opponent, but the smaller and lighter KV-1 and JS tanks successfully took over this role. With a weight of 52 tons, the KV-2 was the heaviest Soviet tank when the war began. It gave German tankers serious problems with

its thick armor (75 mm [2.95 in.]) and 152.4 mm howitzer. A largely unknown project was the 266-ton "armored cruiser." In July 1942, it was projected to break through heavily fortified German lines during a counteroffensive. Armor thickness was up to 125 mm. The vehicle consisted of seven modules that could be transported separately. The central module had a turret with two 152 mm howitzers and another turret with two 23 mm rapid-firing cannon for anti-aircraft defense. A 76 mm anti-aircraft gun was housed in the middle. The other four fighting modules each had a T-34 turret with a 76 mm gun. The two drive modules, each housing two diesel engines producing 1,000 to 1,500 hp, gave the vehicle a top speed of 36 kph [22.37 mph]. The crew was set at thirty-four, and a combat group could also be accommodated. The project was shelved on October 6, 1942. In Great Britain, Vickers developed the five-turret A1E1 Independent in 1922. It was envisaged as a cavalry tank. In principle, it was a development of the Mark tanks of WWI. The Independent had a gun turret mounting a three-pounder gun and four machine gun turrets. It weighed approximately 32 tons and had a maximum armor thickness of 28 mm [1.1 in.]—typical for the day. Its air-cooled Armstrong-Siddeley V-12 inline engine produced 350 hp and the vehicle was capable of reaching 33 kph [20.5 mph]. The prototype was delivered in 1926, and underwent extensive testing. In 1935, the British abandoned development, as the tank, with its four turrets, had proved useless. The Soviet Union was inspired by the A1E1 and developed the T-35. Germany took a similar path with the *Neubaufahrzeug* (New Construction Vehicle). In 1940, the A1E1 (the Independent) was supposed to have taken over defense of Camp Bovington (Royal Armoured Corps). In 1949, it was placed in the museum there. In 1939, an order was placed for the 80-ton TOG 1 (The Old Gang). It too was completely orientated to the armored tactics of WWI and was supposed to roll up trench-style battlefields. Its speed was correspondingly low at 15 kph [9.3 mph] (6 kph [3.7 mph] in the field). Its crew consisted of eight men. The tank's turret housed one 40 mm (later 76.2 mm) gun and two machine guns. The TOG 1 was tested in 1940, but its diesel-electric drive with 600-hp M 6 or T1E2 engines proved very unreliable; consequently, tests were also carried out with hydraulic power transfer. The wheel mountings were unsprung and offered very poor driving qualities. The similar TOG 2 appeared in 1942. Its running gear was lower and a 76.2 mm gun was fitted. Maximum armor thickness was 225 mm [8.86 in.]. Six prototypes of this tank were tested in 1943, but the vehicle was subsequently found completely unusable and development was halted. In 1943, development of a new heavy tank was begun in England.



The Soviet KV II heavy tank.

The American M 6, or T1E2.

The goal was to break through the latest German defensive positions and defeat the German Tiger tank, with its powerful 88 mm gun. The resulting 79-ton A39 Tortoise was in fact an assault gun with a 95 mm gun and three 7.92 mm Besa machine guns; six were built. The 600-hp Rolls-Royce twelve-cylinder four-stroke engine gave it a speed of just 20 kph [12.4 mph] with a maximum range of 140 km [87 miles] on roads. Power to weight ratio was just 7.6 hp/ton. In 1945, a prototype was successfully tested in Germany. The tank's 3.91 meter [12.83 ft.] width made it impossible to transport by rail. An example of this tank is in the tank museum in Bovington. The USA was also working on a heavy breakthrough tank in 1940. In 1942, the result was the M 6 (also designated T1E2), a 56.3-ton tank that was supposed to be impervious to 75 mm shells. This was achieved with armor up to 100 mm [3.94 in.] thick. It was powered by a nine-cylinder aircraft engine producing 800 horsepower. The six-man crew served a 76.2 mm tank cannon, three to four 12.7 mm machine guns, and two 7.62 mm machine guns. Only about forty examples were built and subsequently used for training. The T 28, later designated T 95, appeared in the USA towards the end of the war. Like the British Tortoise, this tank was in fact a heavily armored assault gun. It was developed in 1945 to break through heavily fortified German defensive positions, for example the Westwall (Siegfried Line). The vehicle weighed 95 tons and was eleven meters [36 ft.] long. The T 28 drove on four tracks that gave it a width of 4.39 meters [14.4 ft.]. The outer tracks with road wheels and the outer armor could be removed with the mounted crane for transport by rail. The 500-hp Ford V8 engine was good for a speed of just 13 kph [8 mph], which was equivalent to a power to weight ratio of just 4.3 hp/ton. Its range was 100 kilometers [62 miles]. Armament consisted of one 105 mm cannon and one machine gun. The tank's strength lay in its 300 mm [11.8 in.] thick frontal armor, offering protection against the feared German 88 mm gun. Two prototypes were built. Further developments of this vehicle were the T 29 and T 30, but they were lighter and had conventional revolving turrets. The Americans also abandoned these developments. Two prototypes were built, one of which was later destroyed by an engine fire. The other is in the Patton Museum.

In Japan, the O-I project for a multi-turret, super-heavy tank was initiated in 1940. Initial planning envisaged a weight of 100 tons with three turrets and two 550-hp engines. Design speed was 25 kph [15.5 mph]. The O-I was 10 meters [32.8 ft.] long and 4.2 meters [13.78 ft.] wide. Its crew consisted of

eleven men and was responsible for serving the 105 mm gun, two 47 mm guns, and three machine guns. Maximum armor thickness was 200 mm [7.87 in.]. The prototype was tested in 1941. The running gear was found to be too weak and the tank was scrapped. The Japanese reworked the project in 1943, resulting in a 120-ton tank. An 1,100 hp BMW aero-engine now powered the tank. The larger engine resulted in deletion of the rear turret, which was replaced with a second machine gun turret. In addition to the 105 mm Type 5 gun, the main turret was given an air defense turret with 20 mm guns. The tank's fate is not known, but it may have been tested in Manchuria. The German military kept watch on international tank design, and Hitler in particular feared the appearance of super-heavy Russian tanks by spring 1943 at the latest after the Russian T 34, heavy KV-1, and 52-ton KV-2 had caused a problem for German tanks in 1941. In early 1942, Hitler also received reports about small numbers of Soviet giant tanks of over 100 tons armed with a 105 mm gun and two other guns plus four machine guns. The maximum speed of these tanks, which were restricted to paved roads, was only 15 kph [9.3 mph]. Hitler wanted to take the lead in development, so in early 1942, he directed the Krupp Company to develop a 72-ton tank. On March 5, 1943, a directive was given to Krupp to have not a 72-ton, but a 100-ton ready for testing as soon as possible—at least before the spring of 1943. On March 21, 1942, a contract was also issued to Porsche for the independent design of a 100-ton tank. It was originally dubbed *Mammut* (Mammoth), but for security reasons it was given the name *Mäuschen* (Little Mouse). This developed into the Porsche-Maus in July 1942. Krupp's project was called the Krupp-Maus or Tiger-Maus, as mainly Tiger components were used in its design. Then, at the end of December 1942, a 130-ton "cut down version" was developed from the original 155-ton vehicle. On February 17, 1943, the armor of the Tiger-Maus was again increased in thickness and it became the *Übertiger* (a Tiger with Maus armor). Several somewhat lighter projects were created the same way, like the 76-ton *leichte Löwe* (Light Lion) and the 90-ton *schwere Löwe* (Heavy Lion), also based on Tiger components. All of these projects were shelved in favor of Professor Porsche's Maus. On June 23, 1942, Hitler gave the contract for a 1,000-ton large tank to Krupp. The proposal for this came from director Dipl.Ing. E. Grote, the same person who had tried to sell his giant tank project to the Soviet Union in 1931. In Germany, he was now the special representative of the Reich Ministry for Armaments and Ammunition responsible for U-boat construction. Drawing board designs were created for the *Ratte* (Rat) 1,000-ton land cruiser 11 meters [36 ft.] high, 14 meters [46 ft.] wide, and 39 meters [128 ft.] long (in essence a mobile family home). Its armament was envisaged as a gun turret housing two SK C/34 280 mm naval guns (the guns used by the Gneisenau class battle cruiser—actually the complete three-gun turret from which the center gun was removed to save space), plus one 128 mm tank cannon. Added later were eight 20 mm Flak 38 (four quadruple mounts) and two MG 151s on the rear of the tank. The propulsion system required 16,000 to 17,000 horsepower derived from eight Type MB 501 20-cylinder marine diesels or two MAN 24-cylinder marine diesels, which were to give a speed of 40 kph [25 mph]. Power to weight ratio was 16–17 hp/ton, armor thicknesses ranged from 150 to 360 mm [5.9–14 in.] and the crew consisted of twenty men. This project was not abandoned until December 3, 1942. For an entire year, valuable engineering resources were wasted on a vehicle for which there were neither roads nor railways. Even the idea of disassembling it for rail transport and reassembling it at its destination made almost no sense at all. But even this was not the end of the fantasy. In December 1942, there came the project for a 1,500 ton self-propelled chassis on which would be mounted an 800 mm Dora cannon, the biggest gun in the world. This vehicle was 7 meters [23 ft.] high, 18 meters [59 ft.] wide, and 42 meters [138 ft.] long. It would have had a crew of 100, and its frontal armor was to be 250 millimeters [9.84 in.] thick. Apart from the aforementioned 800 mm gun, its armament consisted of two 150 mm heavy field howitzers (s.FH 18) and a variety of machine guns. Propulsion was provided by four MAN U-boat diesels each delivering 2,200 hp, which were supposed to give a speed of 15 kph [9.3 mph] at a power to weight ratio of 8.8 hp/ton. The fording ability of two meters [6.56 ft.] was supposed to help ford most rivers, as use of roads and bridges would be impossible. These two senseless projects were canceled by Albert Speer in 1943, as was the Urling project powered by 6,400 turbine horsepower in 1944. These fantasy creations cost untold quantities of resources and had no tactical value whatsoever. Following abandonment of the Tiger-Maus in 1943, the Army Ordnance Office (HWA) conceived a new series of armored vehicles based on frontline experience that were to be assembled from standardized components. Five different weight classes were planned: the E-5, E-25, E-50, E-75, and the E-100. The new E-Series was supposed to replace all existing type series in 1944–45, and later even replace the Maus. The heaviest vehicle was the E 100 (E for *Entwicklung* or development + weight class in tones), and was to have been built by Adlerwerke, a company with no experience in tank construction. Development began on June 30, 1943, under the aegis of the Army Ordnance

Office. Despite a production halt in July 1944, when a Führer order called a halt to all work on super-heavy tanks in favor of lighter tanks, work on the E-100 project continued, albeit at "half throttle" (with all of three workers). German industry was being hard hit by the Allied strategic bombing campaign. A hull without turret was assembled in Haustenbeck (Sennelager) by spring 1945. The E-100 was of conventional construction—similar to the *Königstiger*—weighed approximately 140 tons, and was supposed to be fitted with the production turret of the Maus I or later the Maus II, with one 150 mm KwK 44. A 170 mm cannon was also considered but without a revolving turret, as it was realized too late that the planned turret ring diameter would not fit in the tank. The vehicle would have been used only as an assault gun. The planned power plant (a Maybach HL 234 with turbosupercharger and fuel injection, delivering approximately 1,000-1,200 hp) was also not ready, so a 700 hp Maybach HL 230 P30 was installed instead. The resulting power to weight ratio was 5 hp/ton, reducing the planned performance of the E-100 hull accordingly. The frontal armor was 200 mm [7.87 in.] thick, while the rear armor was 150 mm [5.9 in.] thick and the side armor 120 mm [4.72 in.] plus appliqué armor. With a width of 4.48 meters [14.7 ft.] (the Maus was 3.7 meters [12 ft.] wide), it was not capable of being transported by rail, so it would have had to use the laborious method of replacing the wide battle tracks—which lowered ground pressure—in favor of narrower transport tracks. At the same time the outer road wheels, track sprockets, idler wheels, and track guards (which acted as appliqué armor) would have to be removed. In turn, it was planned to mount a crane on the turret. The English discovered the vehicle together with the incomplete *Grille* (Cricket)17-cm-K44-(Sf)-/Gw-VI self-propelled chassis at the Haustenbeck testing grounds. The E-100 hull, weighing approximately 90 tons, was completed, and in June 1945, it was shipped to England for testing. There its trail disappeared. It was probably later scrapped or destroyed as a range target. Unfortunately, no test reports are known to have survived.

Development of the Type 205 – From Little Mouse to Mouse

The Concept of a Super-Heavy Tank

The "Memorandum on the further technical development of the German tank arm" by *Sturmbannführer* Dr. Ing. Brandt of March 23, 1940—the contents of which included a call for the development of a large tank impervious to enemy anti-tank guns and weighing about 100 tons with 100 millimeters [3.94 in.] of armor—may have been motivation for Hitler to order such a huge tank. During a conference at the Reich Chancellery on November 29, 1941, it was decided Professor Porsche should be given the task of developing a super-heavy tank so that Germany would be prepared for the future. On March 21, 1942, the firm received the contract for the independent design of a 100-ton tank. As previously described, this design contract was issued in anticipation of a Soviet super tank weighing in excess of 100 tons equipped with a 105 mm gun, two more guns, plus four machine guns, with a speed of 15 kph [9.3 mph]. This referred to the approximately 110-ton KV 5, development of which had been completed by the Soviets in August 1941, but was then not produced. There is disagreement among authors concerning the date of the contract to Porsche. Karl R. Pawlas cites June 8, 1942. Walter Trojca and George Forty support this date. They refer to the British records of the interrogations of Porsche staff on October 11, 1945. In his biography *Meine Leben*, Professor Porsche's son Ferry writes that Hitler's meeting with his father took place in the Reich Chancellery in June 1942. Porsche was given the task of building a super-heavy tank with a 128 mm and a 75 mm tank cannon in one turret. Ferry Porsche describes the dispute between Porsche and Hitler, which is quoted here because it so perfectly illustrates the purpose of this project:

> It goes without saying that my father first wanted to learn from Hitler for what operational purpose this monstrosity was intended. Hitler explained his concept to those present: "I imagine that such a tank will operate in formation like a battleship, escorted by smaller tanks that drive ahead or accompany it as escort vehicles and protect it against mines or attackers from the air. Its firepower will be sufficient to overcome any resistance. What do you think of it, Herr Professor?" My father was much too much an engineer and too little a military man not to state his opinion to Hitler quite drily, and he said to him something like, "I don't think much of expending material and labor forces badly needed elsewhere on such a project. I am much too unfamiliar with military thinking to be able to say clearly what advantages a mammoth tank like this could bring." Hitler replied: "I have another role in mind for this land battleship. It looks as if we can use a series of mobile bunkers to reinforce the Atlantic Wall, which has gaps in several places. Let us assume one of these concrete bunkers is destroyed during an attempted enemy landing; this steel monster could then close the breach very quickly and with its enormous firepower hold off the enemy until the bunker is operational again. The big tank will be available for this task whenever needed.

Only the timing is incorrect, for the minutes of the armaments conference on March 21–22, 1942, confirm the contract for the independent design of a 100-ton tank to Professor Porsche under Point 18, especially as the first design drawing of a Porsche 205 is present on June 4, 1942 (K 3381 – see p. 138). Generally speaking, Professor Porsche was given a free hand in developing the tank. The military, including *Generaloberst* Guderian, was skeptical about the sense of this project, which was entirely understandable. Also of a completely different opinion was the Army Ordnance Office and *Oberbaurat* Kniepkamp, which in any case was always on a collision course with the headstrong Professor Porsche; it had fundamental doubts as to whether such a heavy tank could be steered on account of its high ground pressure. Armaments Minister Speer also had doubts on account of the high material usage (95 tons of raw steel were required to make a Tiger I, but 280 tons were needed for a Maus, to say nothing of the amount of copper (Ferry Porsche: *Mein Leben*, p 136). None of them expressed their doubts to Hitler. To Porsche, as an engineer it was a challenge. His personal secretary and nephew Ghislaine E. J. Kaes said in a letter:

> Porsche accepted every suggestion, every task. He always tried to meet every challenge—he called it

pulling through—and worried neither about practicality nor about the possibility of mass production. The customer had to decide that, he said. He was neither a general staff officer nor procurement minister. This attitude soon brought Porsche into opposition with the military on the one hand and Speer on the other, neither of whom could prevail with Hitler.

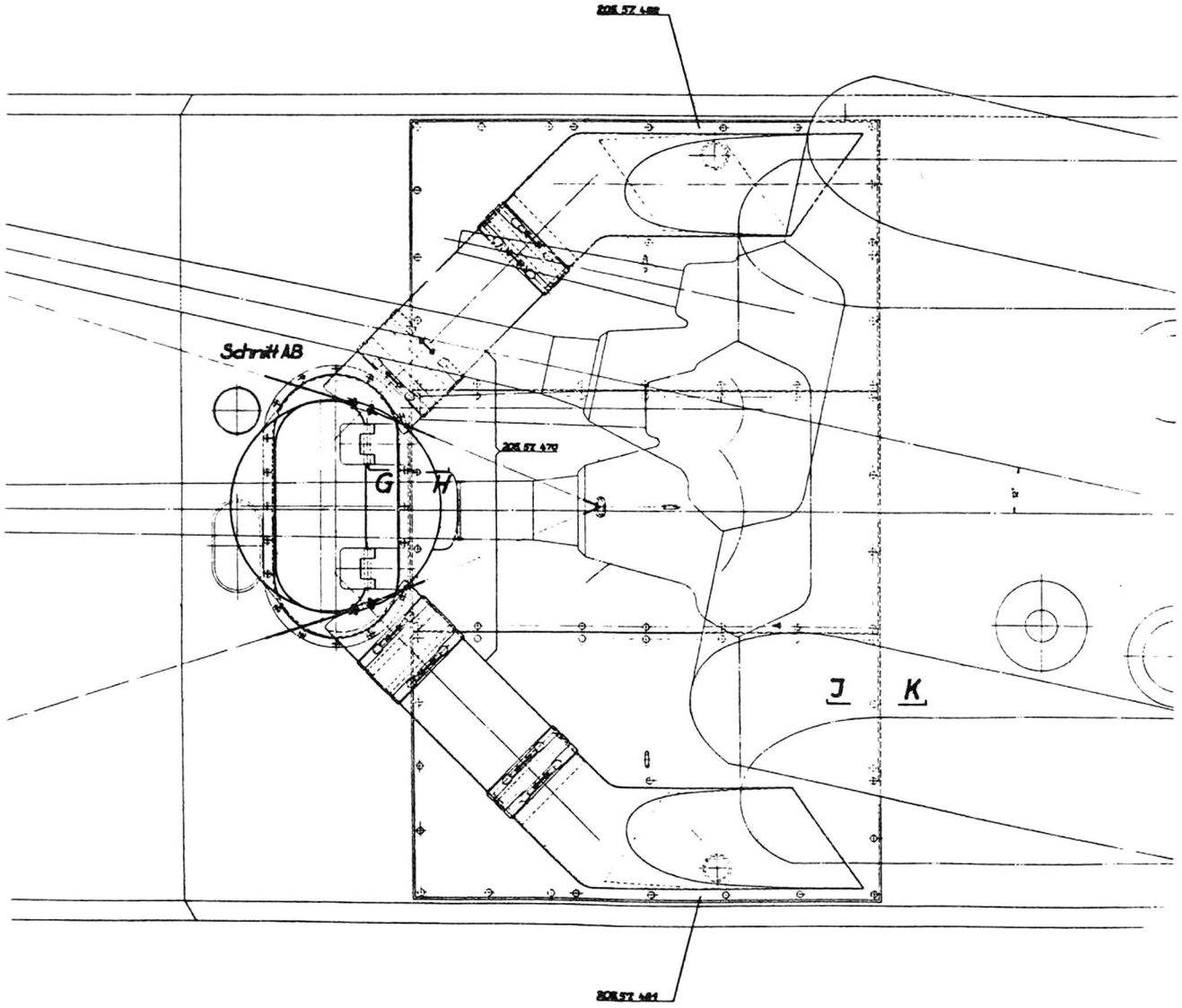
On May 13, 1942, Hitler decided the 100-ton tank should have a heavy gun with at least 100 rounds of ammunition and a machine gun. Hitler emphasized that "the appearance of very heavy Russians tanks must be expected with certainty this spring." He therefore demanded the super-heavy tank being designed be pursued with all energy and considered a reduction in weight to 70 tons to be an error. He even had no qualms about accepting a weight of 120 instead of 100 tons. Maximum armor thickness was what counted, combined with the most effective gun. From the beginning he demanded a length of L/60 and possibly even L/72 (*Germany's Armor in World War II*, p 119). Hitler understood this tank should be a slow-moving vehicle (a mobile fortress). This statement meant the subsequent development of the Maus was headed for a dead end! The first design drawing of the Porsche Type 205 was ready on June 4, 1942. This drawing, by engineer Leopold Schmid, showed a tank of approximately 120 tons with an advantageous shape because of its sloped armor plates on all sides. Armor thickness was up to 120 mm [4.72 in.]. The turret weighed 23 tons and had a 150 mm gun with a length L/40 (length of the gun = caliber x the number, here 40); it was supposed to achieve a rate of fire of four to five shots per minute. The tank's shells were 1,630 mm [64 in.] long and weighed a considerable 69 kg [152 lb.]. Thirty were accommodated in the turret and thirty-six in the hull. Fuel capacity was 1,700 liters [449 gals]. For propulsion Professor Porsche chose his proven concept of the diesel-electric drive with the help of an air-cooled 16-cylinder engine. To understand why Professor Porsche chose this principle one has to look back. A passionate electrical engineer, Professor Porsche had designed the world's first fully functional hybrid automobile with serial hybrid drive in 1900. Called the Semper Vivus, the vehicle had generators coupled to two gasoline engines forming a charging unit. This provided the battery and the wheel hub motors with current. The generator also served as the starter. As a full hybrid, the car was capable driving long distances on pure electric power until the gasoline engine had to charge the battery again. This concept, albeit without battery drive, was then used in heavy road trains during WWI. The motorized lindworm—called the A-Zug (A Train) and later the größer B-Zug (Large B-Train or Landwehr-Zug, named after an *oberst* in the general staff with the same name)—was supposed to transport cargoes through the countryside to the front. With a wheel attachment, it was also capable of driving on railway tracks. The principle: a relatively small tractor drove in front. Its 100 hp gasoline engine drove a generator. This in turn powered not only the electric motors of the tractor's rear axle, but with the help of a long cable the electric motors in the wheels of all ten trailers as well. This way the trailers were not towed, but were self-propelled. So that this train could even manage the narrowest serpentines in the Alps, each trailer had a so-called counter-tow bar. As a result, each trailer drove in a track. Particularly heavy loads could be transported over temporary bridges by having the tractor drive ahead and the trailers follow across the bridge individually via the long cable. After all had crossed, the train was reassembled. Even more powerful was the C-Zug (C Train). It was a tug that made the heavy 380 mm or 420 mm mortars by Skoda transportable. For this purpose a 150 hp generator truck propelled an eight-wheeled trailer with electric motors. Ten wheels were thus powered on each train. With a maximum load of 26 tons, a trailer's maximum weight reached 38 tons. Top speed was 20 kph [12.4 mph] and grades of up to 25% could be negotiated. Five autonomous units were needed for one gun. After a wheel change the vehicle was capable of driving on tracks. Professor Porsche revisited this drive concept for his first tank project, the VK 3001 (P) Leopard—also called the Type 100 or *Sonderfahrzeug* I (Special Vehicle I) within the company—because such simple control was possible without a complicated transmission. The controversial VK 4501 (P) Porsche Tiger—or Type 101 / Sonderfahrzeug II internally—was also based on this concept. The running gear was particularly simple and cheap to manufacture. It consisted of the knee lever with the patented Porsche torsion bar that had proven itself really well in the VK 4501 (P). The Germans used the C-Zug successfully during WWII. In the beginning of the Porsche Type 205 program, an air-cooled 16-cylinder diesel engine powering a generator was envisaged. Porsche saw the air-cooled diesel as the ideal propulsion unit for a tank because it was economical, robust, and required little maintenance. In addition, it had significantly better reliability because of its diesel fuel. A diesel engine also has favorable torque at low revolutions, which is beneficial for a tank. After developing the VW, Professor Porsche had solid experience with air-cooled engines. One electric motor was used for each track. Ground pressure was 0.92 kg/cm² [13 lbs/in²]. A shortened variant, the K 3383, was also designed. Another design was the K 3382 of June 17,

Landwehr train during WWI.

1942, which was conceived as a twin-turret tank. The chassis was longer, and the turret with the 150 mm L/37 gun had another, independently revolving turret with a 75 mm KwK L/24. Because of the heavy armor its weight rose to 140 tons. The crew consisted of seven to eight men. Hitler approved the drawings of the Porsche tank on June 23, 1942, but wanted a variety of changes. The floor of the hull was to be thickened to 100 mm [3.94 in.] for better protection against mines. He did not think the second turret necessary, as this tank would only be used in concert with escorting tanks. Furthermore, an assessment was to be made whether the installation of a 105 mm KwK L/70 might be more suitable on account of its higher rate of fire, greater number of rounds carried, and easier loading. Professor Porsche agreed to deliver the first tank by May 12, 1943. On June 25, 1942, the Army Ordnance Office (WaPrüf 6) directed Krupp to design a turret for the Mäuschen by July 17. The basic parameters of the turret: 360 degree traverse, 250 mm [9.84 in.] frontal armor and 20 mm [0.79 in.] side and back armor, an 80 mm [3.15 in.] thick turret roof, two guns with -7 to +25° elevation, 150 mm KwK L/37 with maximum range of 16 km [9.94 miles], a muzzle velocity (Vo) of 750 m/sec [2,460 fps], and the ability to penetrate 190 mm [7.5 in.] of armor at a thirty degree firing angle and 1,000 meters [3,281 ft.] range. The second gun was to be a 75 mm KwK 37 L/24 with a maximum firing range of 7 km [4.35 miles] and the ability to penetrate 50 mm [1.97 in.] of spaced armor at thirty degrees and 1,000 meters [3,281 ft.] with *Panzergranatpatrone* 39 HL ammunition. The turret was not to exceed a maximum weight of 57 tons and be electrically or manually traversable. Turret weight had more than doubled from the original 23 tons. The subject of debate at the next consultation between Krupp and Porsche on August 27, 1942, was the problem of the railway loading profile. The 3,150 mm [124 in.] width could not be maintained and the turret had to be reduced by 200 mm [7.87 in.] on each side. The Reichsbahn allowed 3,300 mm [130 in.] for tank transports. The height also did not fit into tunnel dimensions. Krupp suggested a hanging transport between two bogies,

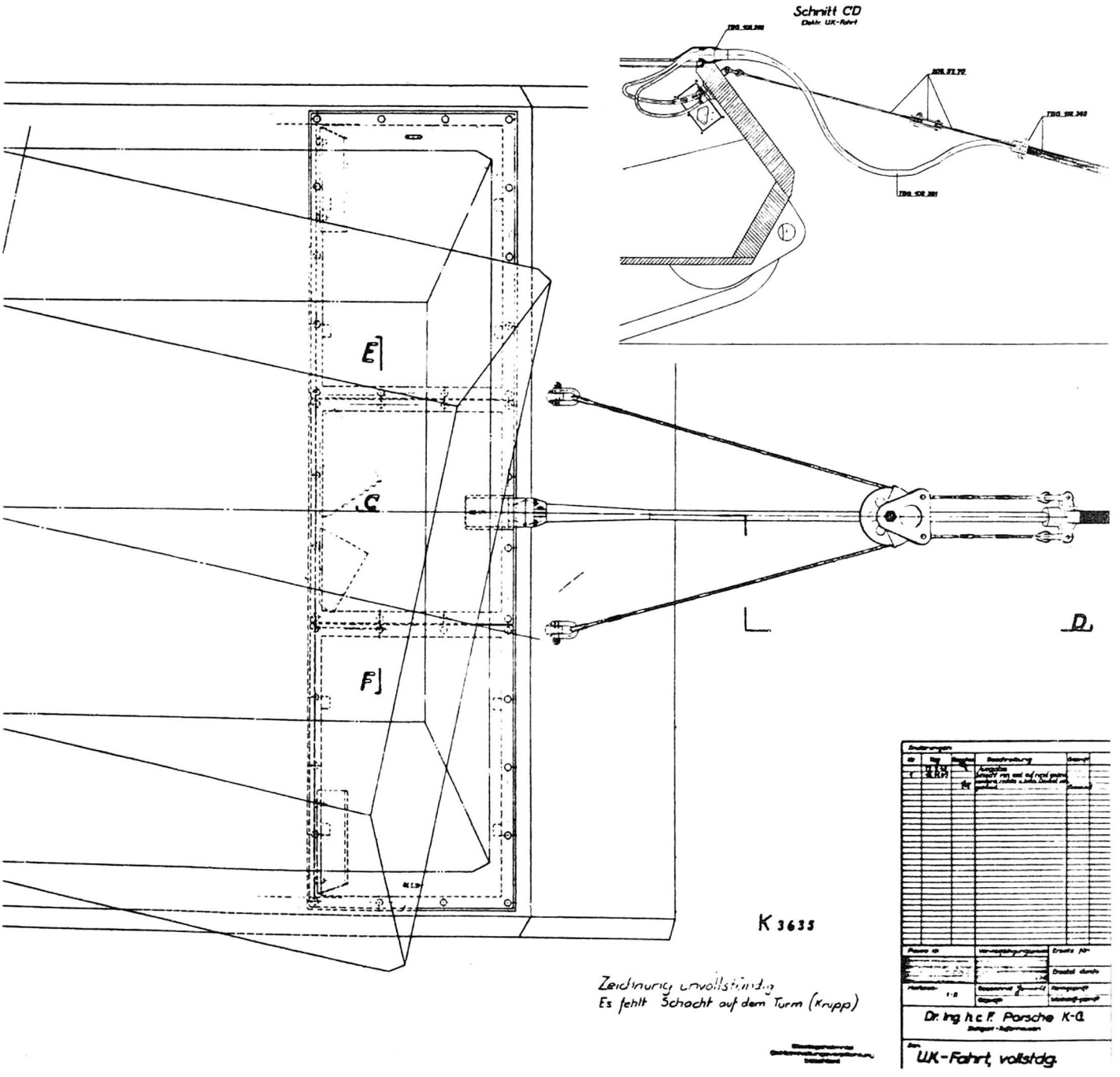
The C-Train was also used by the Germans during WWII.

similar to that of the French Char 2 tank. On September 22, 1942, WaPrüf 4 advised Krupp the turret for Project Löwe (Lion) was no longer to be produced and was to be replaced by the Maus turret. On October 5, 1942, Karl Rabe (senior engineer with Porsche) created a table that made it apparent there was to be a Porsche 205 A and a 205 B. Both now weighed 150 tons and were designed for 20 kph [12.4 mph]. Ground pressure was 1.54 kg/cm² [21.9 lbs/in²]. Distribution of ammunition for the 150 mm gun was 22 rounds in the turret and 20 in the hull; for the 75 mm gun 45 rounds were in the turret and 50 were in the hull. The turret had the two guns of the K 3384 design and a climbing ability of 25 degrees (47%). The difference between the two types was their engine equipment. Type A was to have a Daimler-Benz MB 507 diesel engine without supercharging with an output of 850-900 hp. This was sufficient for a power-to-weight ratio of 6 hp/ton. On the other hand, a Porsche air-cooled diesel engine was envisaged for the Type B that with supercharging produced 700 horsepower, resulting in a power-to-weight ratio of 4.7 horsepower per ton. Hitler was briefed on the Mäuschen's state of development at the armaments conference on October 13, 1942. A new design designation (K 3384) originated from engineer Leopold Schmid. The tank was up-armored again, the hull shape had been changed, and the turret had a double mantlet for a combined mounting of the 150 mm KwK L/37 and the 75 mm KwK L/24. This construction principle had already been used in the so-called *Neubaufahrzeug* – Krupp Version (a 105 mm gun with a coaxial 37 mm KwK). An MG 42 was mounted in the hull front in a ball mounting. The running gear mounting remained the same, only two 50 cm [19.7 in.] wide tracks per side were now used. On November 5, Porsche sent a drawing to Krupp in which the hull armor was reduced by 10%, and he asked Krupp to reduce the turret armor from 47 tons to 43 tons to hold weight at 168 tons, as ground pressure was too high. Widening the tracks was out of the question due to the rail loading profile, and a longer track run would have affected the vehicle's driving and steering stability. There was no response to his request, however. Weight was another concern. There were few bridges that could support the tank's individual weight of almost 200 tons. Its two-meter [6.56 ft.] fording ability was of course helpful in crossing rivers, but that was not enough. The tank had to be made capable of submerged driving. Initial experience had been gained in 1940, when a number of Panzer III and IV tanks were fitted with snorkels in preparation for Operation Sea Lion. The Maus, too, was fitted with a large snorkel to supply oxygen. The ventilator screens were fitted with covers, the turret was lowered onto a rubber seal using a simple raising mechanism, and the gun mantlet with special pointed bolts was pressed against a spring diaphragm on the front of the turret. Maximum diving depth was eight meters [26 ft.], but the bottom first had to be checked for obstacles by pioneer divers. When the tank was submerged, water displacement caused the ground pressure to be reduced to about one-quarter of the ground pressure on land, so becoming stuck in the mud was hardly a concern. As the tank's own engine could not be used for propulsion under water for design reasons (unlike the diving Tiger tank, the Maus did

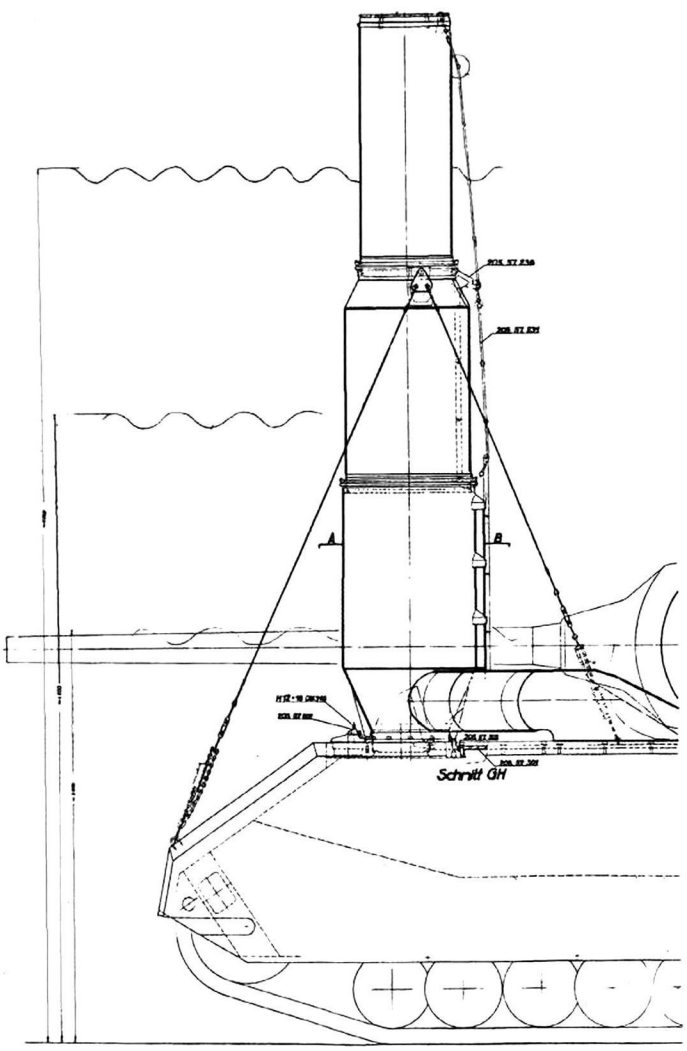


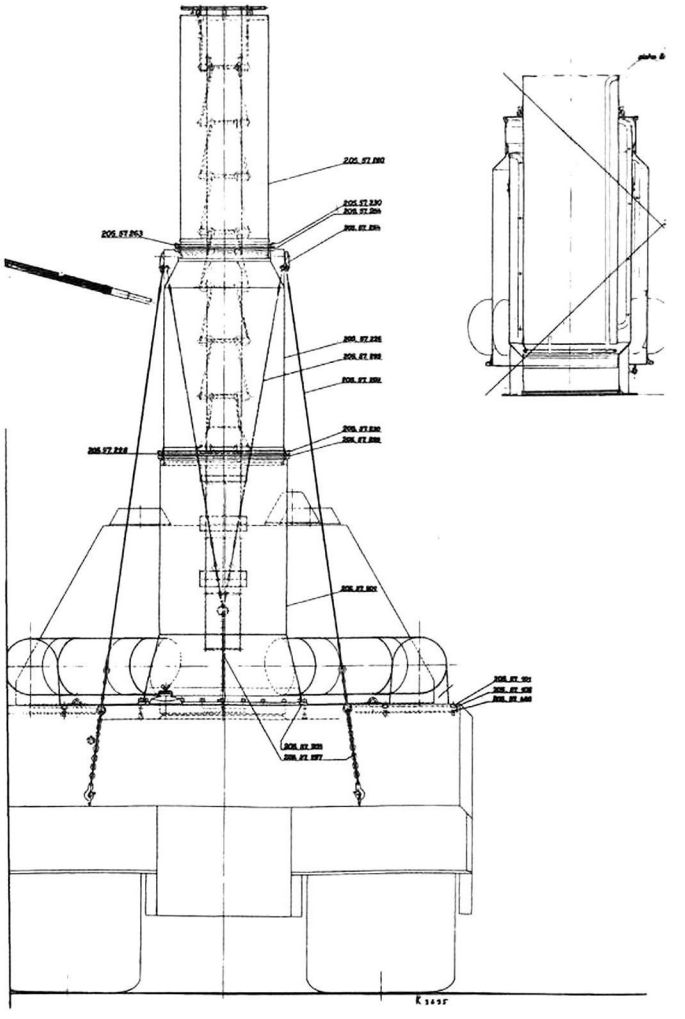
Schematic drawings of the submerged operation equipment.

not have separate engine and radiator compartments), a cable was run from the generator of another Maus waiting on the bank to the electric motors of the submerged vehicle. This procedure provided necessary power for the tank to reach the other side under water. The procedure was then reversed to make the second Maus able to dive. Professor Porsche had employed this principle in WWI with the B-Train. Back then, the trains had easily crossed bridges one trailer at a time, each having electric motors supplied with power by a generator car. This procedure was also supposed to be used in the recovery of a defective Maus, i.e., in the case of engine failure. There was no other recovery vehicle. The turret was turned to the rear (six o'clock). The revolving platform in the turret had a hatch in the rear for ammunition. In an emergency it enabled the crew to pass through a crawlway from the engine compartment to the driver's compartment and then through the air shaft to the outside. The driver or radio operator could also crawl into the turret compartment. Design drawing K 3385 of November 14, 1942, showed the same turret with a completely redesigned hull. The turret was moved toward the rear and the engine compartment, with its 12 cylinder MB 509 gasoline engine, was now between the driver's and radio operator's compartments. This power plant was a derivative of the DB 603 A aircraft engine. As the growing weight of the tank demanded more power and Professor Porsche did not have time to develop a new 16-cylinder diesel engine, the DB 603 A aircraft engine with a continuous output of 1,375 hp was the only available candidate. Its 87 octane aviation gasoline was not available to panzer troops, so compression had to be changed to 6.13 (with new pistons and a smaller supercharger blower) so standard Wehrmacht 74 octane fuel could be used. As a result, performance fell to 1,292 hp at 2,300 rpm and 1.2 atmospheres of boost pressure. The engine's inverted configuration was also a disadvantage. It had been designed this way for use in aircraft to provide the pilot a better view.



As the flange-mounted double generator was on the bottom, an intermediate drive had to be designed. Access to the sparkplugs was also complicated. It was clear to all participants this could only be an interim solution. The MB 507 Schnellboot diesel engine offered on January 9, 1942, was far from suitable, as it produced just 850 hp at 2,300 rpm. The constant weight increases resulted in considerably greater engine performance requirements that the Army Ordnance Office estimated at 1,500 to 1,800 hp. There would not have been space for a larger Schnellboot engine, however. Professor Porsche worked with Simmering-Graz-Pauker AG on a 16 cylinder air-cooled bi-turbo diesel engine in an "X" configuration (SLA-16 48 liter [12.7 gal.] engine producing 1,500 hp at 2,500 rpm with a Brown-Boveri exhaust-driven turbosupercharger) that was later tested in a *Jagdtiger*. The internal factory designation was Porsche Type 220. Also proposed was a Porsche Type 212 18 cylinder air-cooled diesel engine (41.5 liter [11 gal.] V engine) that also produced 1,500 hp and the Porsche Type 305 turbine drive (according to *Oberingenieur* Franz Xaver Reimspiess). At the meeting at Führer headquarters on December 1, 1942, Hitler listened with great interest to a presentation by Professor Porsche and Dr. Müller (a Krupp representative) on the state of development of the Mäuschen. Hitler expected the first prototype vehicle to be complete by the summer of 1943, and placed subsequent monthly production at five vehicles. Krupp was responsible for production. He





also desired a comparison of the 150 mm gun, 127 mm naval gun, 128 mm anti-aircraft gun, and a 128 mm gun with a longer barrel. Design K 3387 (again by Ing. Leopold Schmid) was created on January 1, 1943. Its most noticeable feature was another (fifth) bogie set on each side, which was blamed on the increased weight. The turret was simplified (smooth surfaces) and given a shallower commander's cupola. The troublesome double track was deleted. The proven 75 mm KwK 37 had to be lengthened from caliber length L/24 to L/36, as it was feared powder gas from this gun would be sucked in by the engine and its cooling system. On December 15, WaPrüf 6 advised Krupp that work on its "Tigermaus" was to be stopped and that only the "Porschemaus" with the Krupp turret was to be built. At another armaments conference on January 3, 1943, Hitler declared that Porsche's Mäuschen proposal was to go ahead. Hitler was still convinced the future tank would weigh more than 100 tons and must have the heaviest armor and the most powerful gun. "Superiority can only be assured for a certain battle period (at most a year). Therefore we must already be planning for superiority in 1944. This year the Tiger and Panther are superior. The Mäuschen and the new Tiger with the 88 L/71 must provide superiority in 1944" (Boelcke, *Germany's Armor During WWII*, p 215).

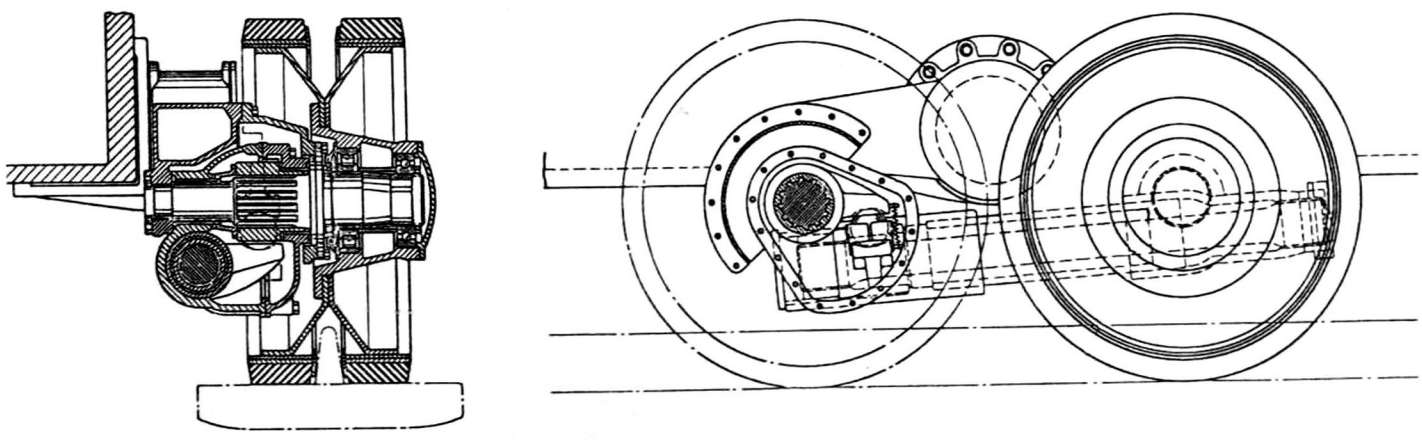
Design was to be Porsche's responsibility, Krupp was to produce the hull and turret, and Alkett of Berlin was to carry out final assembly. Other production sites were Daimler-Benz AG's Stuttgart-Untertürkheim factory for the engine, Siemens-Schuckert of Berlin for the electrical systems, and Skoda for the running gear and reduction gear. The beginning of quantity production was envisaged for the end of 1943. The 128 mm gun was selected as the main armament. Despite this, a turret with a 150 mm gun (later designated the "Maus II Turret") was proposed. Its guns were superimposed one above the other as on Rheinmetall's Neubaufahrzeug. Firing trials were to be carried out with the 128 mm gun using hollow-charge, solid-core ammunition and 12.8/8.8 and 12.8/10.5 sabot ammunition, possibly also with different types of powder. Also to be examined was whether it made sense to lengthen the barrel from L/61 to L/70 when production of the 128 mm gun resumed. An MB 509 test engine was ordered on January 15, 1943. One month later, WaPrüf 6 increased

Example of energy transfer from the VK 3001(P) to the VK 4501(P) during testing of the Porsche Tiger hull.

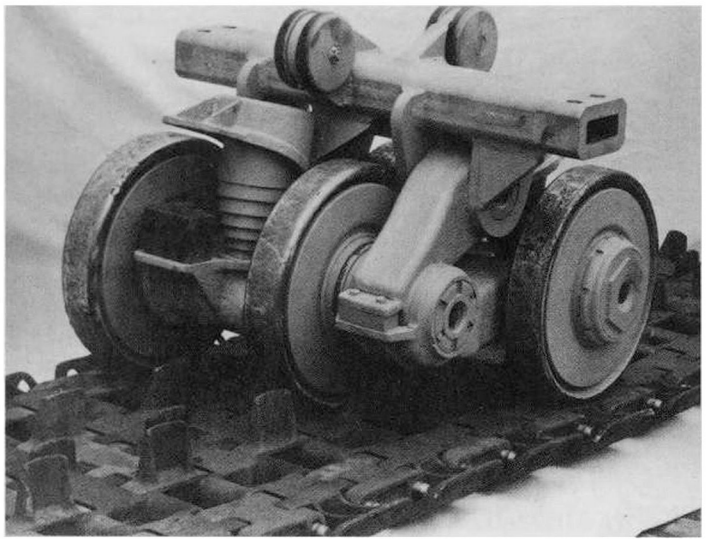
the order to eight MB 509 engines and in March to 180, a contract that was later withdrawn. On January 26, 1943, Krupp determined the 128 mm KwK L/55 was the best possible length for the gun without having to redesign the turret. Representatives of Krupp and Porsche met in Stuttgart in January 1943 to inspect a full-scale wooden model of the Maus and discussed how to proceed. To avoid unnecessarily weakening the 200 mm [7.87 in.] glacis armor, there was to be new opening for the MG 42. Armor thicknesses in the hull were to be 100 mm [3.94 in.] for the front cover plate, 50 mm [1.97 in.] for the center and rear plates, 180 mm [7 in.] on the sides, 100 mm [3.94 in.] track armor, 40 mm [1.57 in.] horizontal track armor, 200 mm [7.87 in.] frontal armor, and 150 mm [5.9 in.] rear armor. Thanks to the sloped armor, the distance a shell had to penetrate to pierce the frontal armor was 350 mm [13.8 in.]. This could not be achieved with the vertical side armor restricted by the rail loading dimensions on the outside and the space requirements inside limited by the engine and generator.

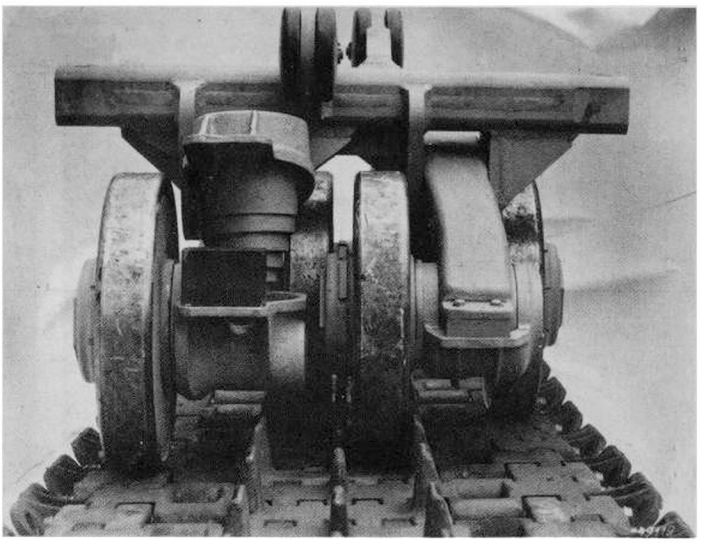
New Requirements Delay the Project

In Berlin on February 2, 1943, Professor Porsche learned from Oberst Haenel of the Army Ordnance Office that in addition to the guns, the tank was also going to have to accommodate a flamethrower with 1,000 liters [264 gals] of fluid. Professor Porsche could scarcely imagine that a tank with an enormous long-range gun should also carry a weapon



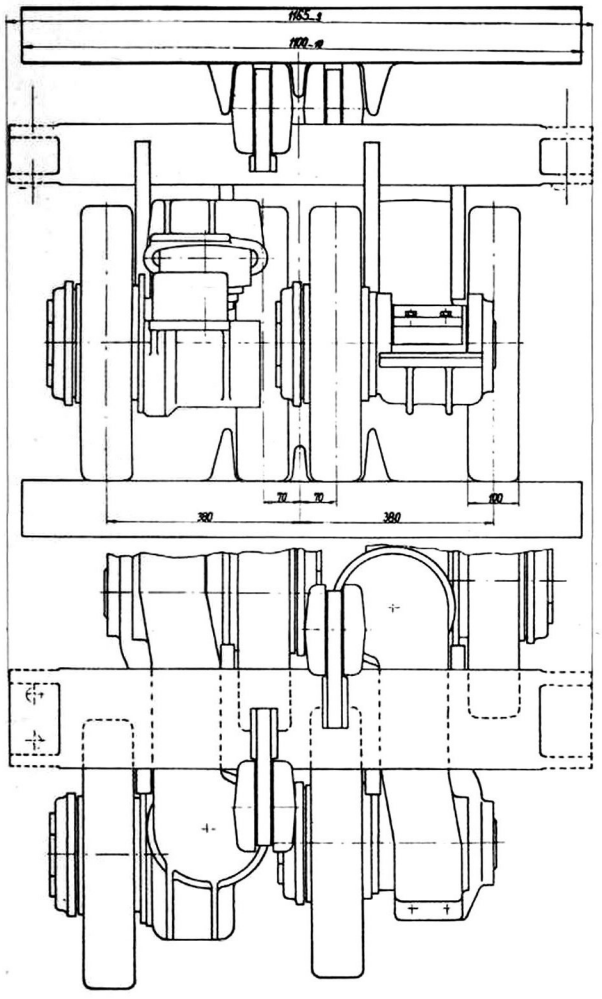
Porsche's patented knee-action running gear with torsion bar suspension from the Porsche Tiger.

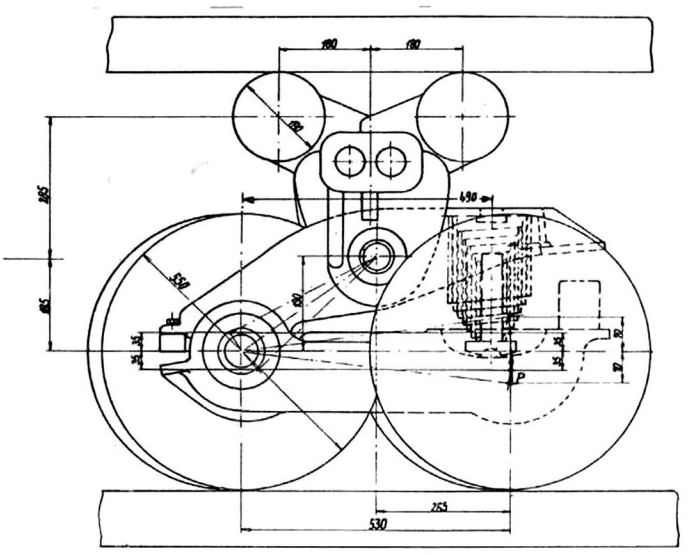




The new road wheels.

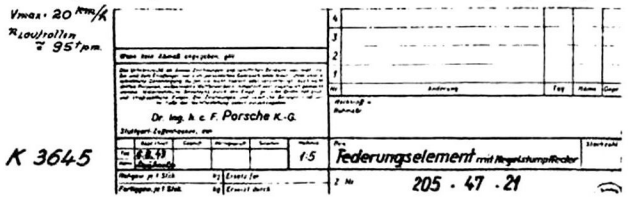
that could only be used in close quarters fighting. The professor categorically rejected this demand. Interestingly, Krupp had contacted the Koebe company on January 23, 1943, to inquire about a flamethrower with a firing range of 150 to 200 meters [492–656 ft.]. The company only offered a 22 mm flamethrower with a range of 100 meters [328 ft.] and volume of fire of 33 l/s [8.7 gal/s] and a 14 mm flamethrower with a range of 50 to 60 meters [164–197] and a volume of fire of 7 to 8 l/s [1.85–2.11 gal/s]. The requested firing range of 50 to 60 meters [64–196 ft.] could not be achieved. On February 10, 1943, all of the participating firms met with representatives of the Army Ordnance Office in Stuttgart and there were heated debates about the effects of the new requirements. The planned production startup was further delayed, and the weight of the tank, already at 179 tons, would be increased by just under five tons. Porsche's planned power plant was not designed for this. The favored knee-lever running gear with torsion bars was no longer suitable. A new design was created in cooperation with Skoda. This was a bogie set supported by conical springs (a type of coil spring). Each bogie set contained two pairs of road wheels plus two support rollers and weighed about 800 kg [1,763 lb.] with lever. Square rubber pads were used as limiter stops. Six bogie sets, each with four pairs of rubber-saving rollers in U-shaped clamps, were mounted on each side. The lifting load per front spring was 2,820 kg [6,217 lb.] and 4,300 kg [9,480 lb.] for the rear springs, as the center of gravity was in the rear third of the tank. The complete bogie set was replaced in event of a defective road wheel. The new running gear resulted in a weight savings of about four tons; it also fit into the hull with no change in bow design, because it permitted an additional set of rollers to be inserted to take on the higher loads and take some of the load off the other elements of the running gear. As the bogie sets were only clamped in place, the usual drilling work on the vertical plates was eliminated, significantly shortening the time needed to manufacture the running gear. The installation of the new running gear could be done as a retrofit without affecting installation of the internal components in the hull. A new 110-centimeter [43.3 in.] wide plate track was developed by Skoda. Each track had 112 track links and was 30% lighter than the previous track. The track was formed in such a way that on soft ground the contact area was greater, thus achieving a lower ground pressure of 1.27 kg/cm² [18 lbs/in²] at a sinking depth of 100 mm [3.94 in.]. On hard ground with no sinking depth, the contact area was smaller and ground pressure was 1.45 kg/cm² [20.62 lbs/in²]. The smaller contact area had the advantage of reduced friction, making it easier to steer the Maus. On soft ground, the angled ends of the big track links pushed side earth away better. As a result, the roughly 17-ton running gear (9.8 tons for the rollers and levers and 7 tons for the 112-link tracks) was very light in comparison to the total weight (approximately 8.5%). By comparison, a single Panther track with 86 track links weighed more than two tons. The running gear was thus about half as heavy as a percentage of total weight than on other tanks. This advantage was negated by the excessively heavy turret (52 tons = approximately 27% of total weight). The turret of a 57-ton Tiger I weighed 11 tons (19% of total weight), while that of the Tiger II was 20% of total weight. Furthermore, two openings were cut in the upper rear plate and an armored flame oil spray head was mounted on each side. The flamethrower's rear armor consisted of two horseshoe-shaped 150 mm [5.9 in.] thick armor plates. A tank for 1,000 liters [264 gals] of flame oil, a pump and motor, and two operating mechanisms in the radio operator's position were also to be installed. Hitler suggested a shell-deflecting screen below

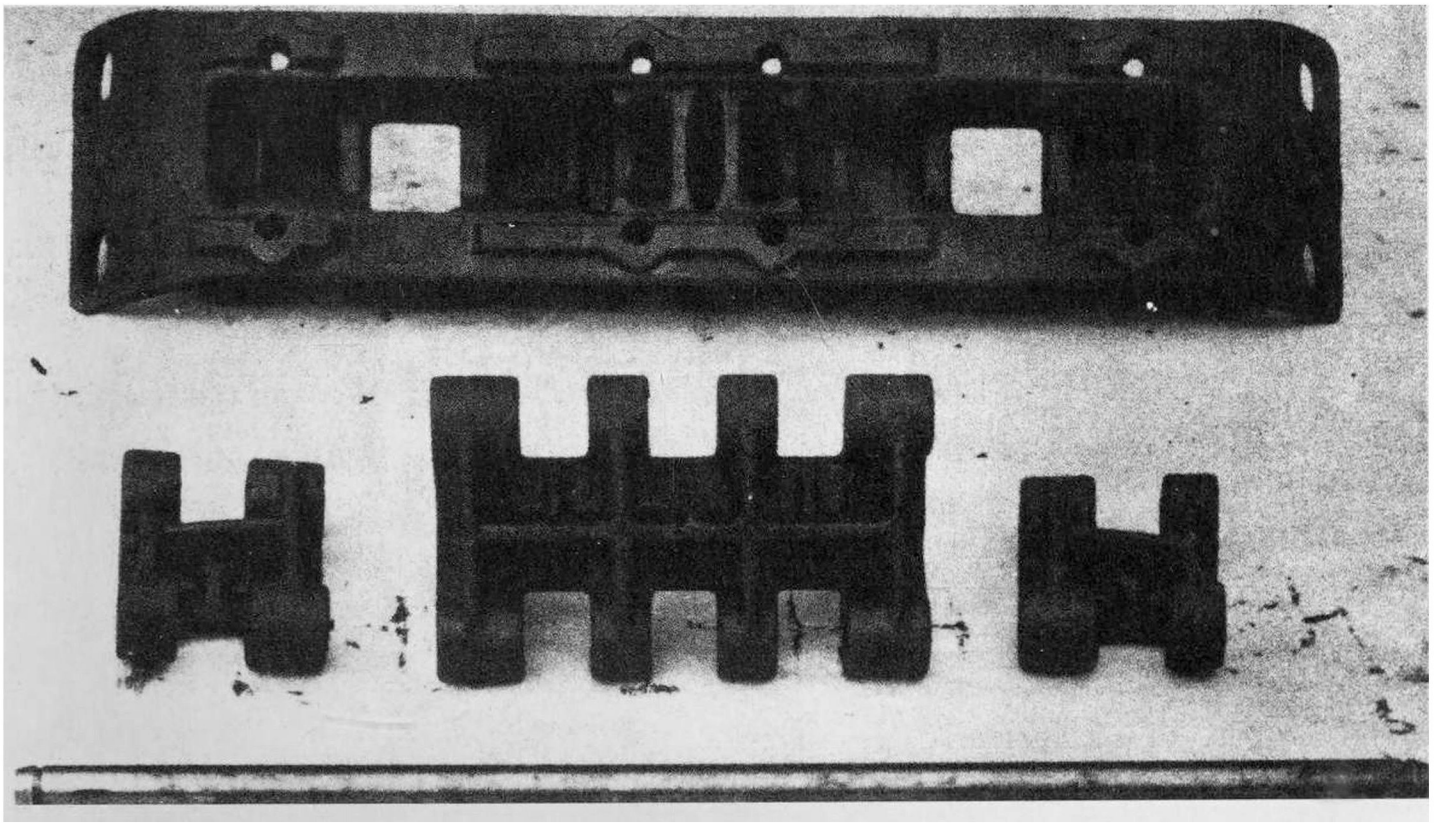




Typ 205 „Maus"

Hebellast P	(für Feder-Rechg.)	vorderes Laufwerk 2830 kg hinteres Laufwerk 4300 kg	im Mittel · 3565 kg
Tragfähigkeit	von 12 Laufwerken (24 Rollen) je Seite von 24 " " (48 Rollen) je Fahrzeug		· 85557 kg · 171114 kg
Fahrzeug-Gesamt-Gewicht	(171114 kg + Rollen u. Hebel 5731 kg + Nebenartikel 2153 kg)		· 187398 kg
Federung	bei einseitigem Anheben einer Rolle		für · 1,30 mm pro 100 kg





Above: a 1.1-meter-wide [3.6 ft] track link with one guide tooth. It weighed about 29 kg [63.9 lb.] (compared to the 0.66-meter-wide [2.17 ft] Panther track link that weighed about 23 kg [75 lb.]). **Below right and left:** the connector links. The center track link had two guide teeth.

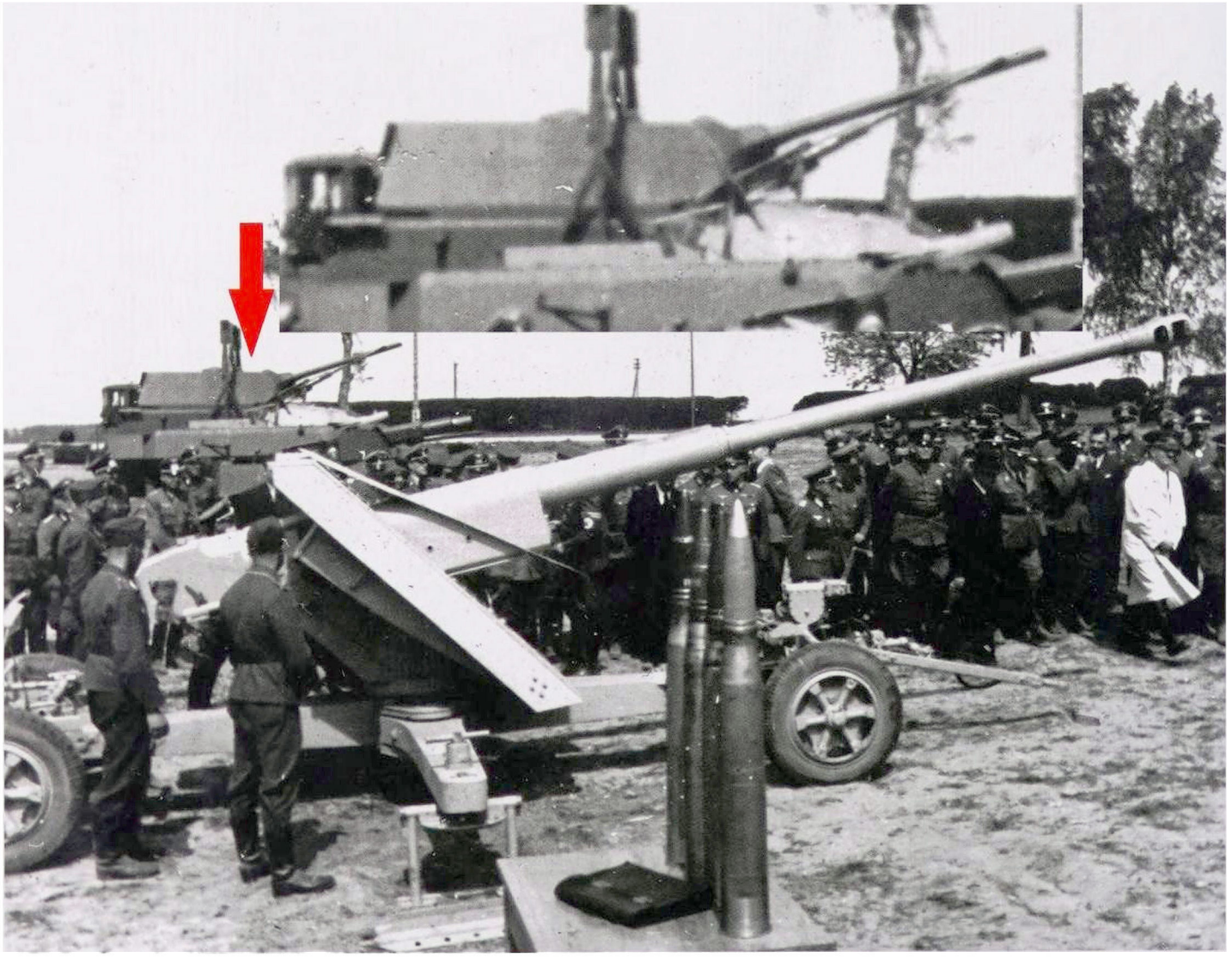
Standing to the left of Hitler are Professor Porsche and Professor Dr. Müller of Krupp. On the right is Speer's deputy, Otto Saur (with left hand raised). Clearly visible are the side-mounted flamethrower nozzles (later abandoned), the old-style commander's cupola (still on the right side of the turret), and the 150 mm KwK L/37 with muzzle brake. The deflector shields in front of the turret have also not yet been installed.

the turret. One was in fact designed, so impacting shells could not jam the turret ring. Meanwhile, on February 6, 1943, Hitler had Minister Speer arrange a demonstration of a wooden scale model of the 150-ton K-Wagen from WWI to get an idea of 100-ton tanks. On January 26, 1943, a contract was issued to Krupp to produce two test hulls and one turret for various gunnery tests at the army testing grounds at Kummersdorf-Gut. These were not complete hulls; instead, because of transport weight, they were just the forward third of the Maus hull. On April 6, 1943, Armaments Minister Speer paid a surprise visit to Professor Porsche in Stuttgart, and without saying a word spent half an hour inspecting the full-scale wooden mock-up. Such wooden models were standard, and were built to be better able to estimate installation and spatial conditions. Original components were also integrated into the model. On April 10, 1943, a decision was made in favor of the two-part 128 mm ammunition. WaPrüf 6 (Motor Vehicle and Motorization Department) opposed this decision by WaPrüf 4 (Artillery Department) and requested a shoot-off. This was carried out with a 128 mm Flak 40 in Meppen on May 20, 1943, and ended in favor of the two-part ammunition. Also in April, six twin cradles were ordered for the prototype vehicles and two twin cradles for the firing tests. Four days after Speer's visit to Stuttgart the order arrived for the model to be taken to Berchtesgaden to be shown to Hitler. It was disassembled, packed up, and prepared for transport. The order was rescinded and everything was reassembled. The order was reissued on May 6, 1943, and the model was again taken apart, made ready for transport, and sent to Rastenburg. At Führer headquarters in Rastenburg on May 14, 1943 (Spielberger, *Senger und Etterlin* states May 1, 1943, but the armament conference was from May 13–15, 1943; also see Pawlas and Guderian), Hitler was shown the full-scale wooden model of the Porsche 205 Maus with flamethrower and a remotely controlled model of the tank in roughly 1:15 scale. The model's turret was equivalent to that of Design 3387 of January 1, 1943. Of this Armaments Minister Speer wrote in his diaries:

Clearly discernible are the armored left flamethrower nozzle and the 1,000 liter [264 gal] external fuel tank. Professor Porsche is explaining the details on a board to Hitler. This wooden model already carries the 128 mm KwK 44.

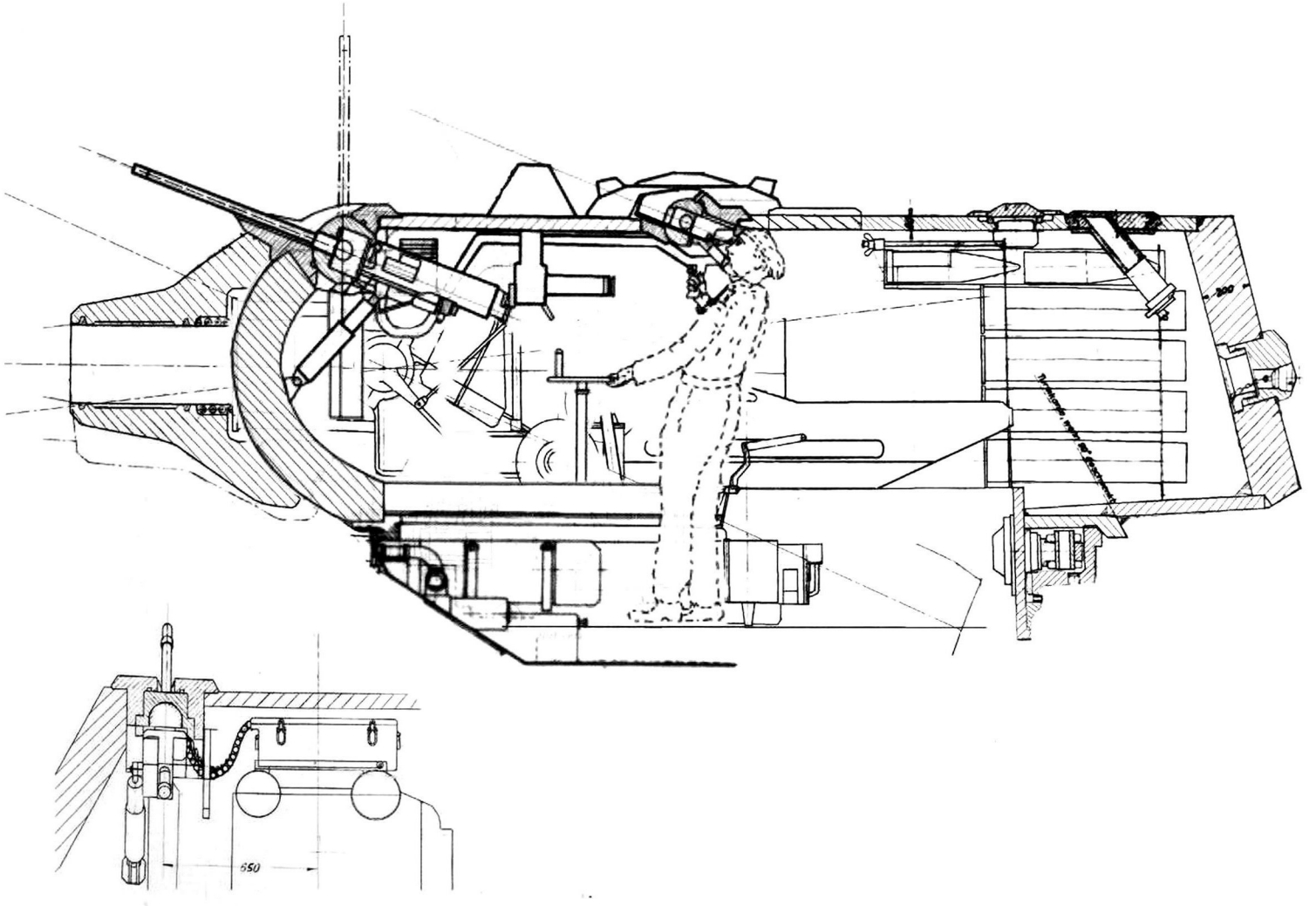
The one-piece cartridge ammunition—approximately 1.6 m [5.25 ft] long—was also shown. Looking at the size of the cartridge shell, one can imagine the difficulty loading the 128 mm KwK 44 inside the tank, to say nothing of the weight. Here the shell deflectors are in place in front of the turret.

The full-scale wooden model of a 180-ton tank that he [Hitler] had himself demanded was demonstrated. No one from the tank arm showed any interest in producing this monstrosity, each of which would cost the capacity for the building of six or seven Tiger tanks and create unsolvable supply and spare parts problems, was much too heavy, much too slow (twenty kilometers per hour [12.5 mph]) and furthermore could not be built until autumn 1944. We, meaning Professor Porsche, Guderian, and Zeitzler, had therefore agreed prior to the inspection to at least express our skepticism through extreme reluctance. When asked by Hitler what he thought of the vehicle, Porsche answered curtly and aloofly, "Naturally, mein Führer, we can build such tanks." The rest of us stood about silently. When Otto Saur [State Secretary in the Armaments Ministry and Speer's representative] noticed Hitler's disappointment, he launched into an enthusiastic harangue about the chances and the significance of the monster in terms of weaponry ... Unconfirmed reports about the building of super-heavy Russian tanks pushed the exuberance even further, and in the end the two, free of all factual restrictions, had arrived at the overwhelming fighting power of a tank with a weight of 1,500 tons that would be transported in pieces on railway trains and assembled prior to going into action. When a highly-decorated colonel from the panzer arm finally interjected that a single hand grenade or incendiary device could ignite the vehicle's oil fumes if it could be detonated even close to the cooling air intake, an aggravated Hitler replied to this annoying remark, "Then we will equip this tank with automatic machine guns operated from inside in all directions." In a patronizing manner, turning to the panzer colonel he added, "After all, with all modesty I can claim to be no dilettante in this field, for it was I who rearmed Germany!" (Speer, *Spandau Diaries*, 59)



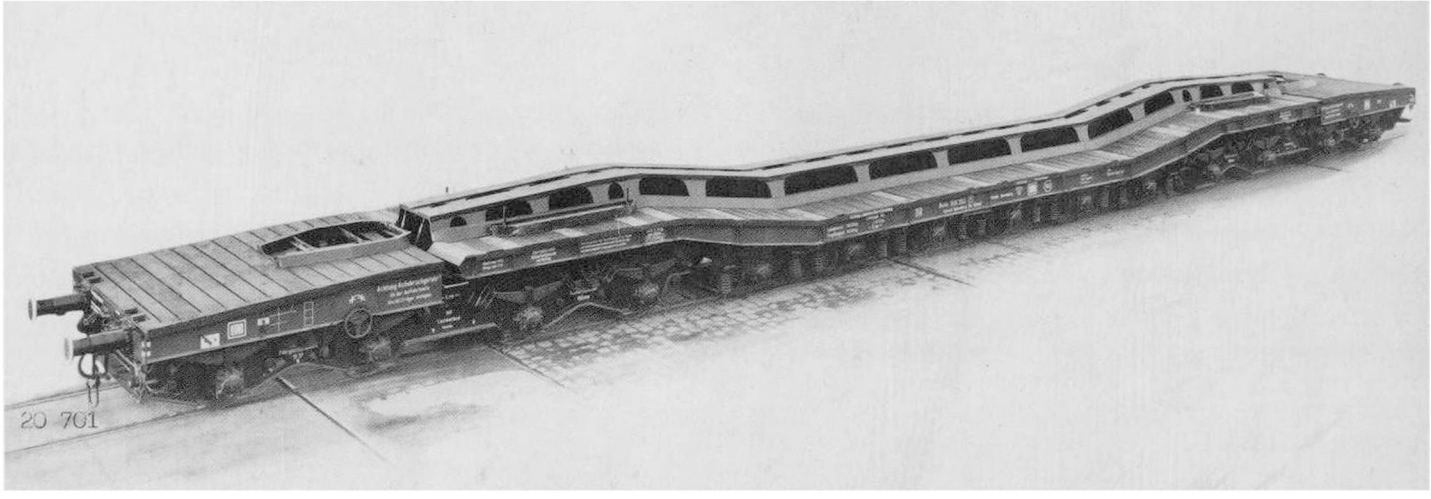
The huge silhouette of the Maus in the background beyond the 88 mm Pak 43 on Type 204 Special Trailer. (This gun was later used in penetration tests using Maus components, specifically the hull and turret. Firing from 100 meters [328 ft], all but one of the attempts to penetrate the Maus armor were unsuccessful.) Just 2.5 meters [8.2 ft] high, the Sturmpanzer IV Brummbär in the foreground looks rather squat.

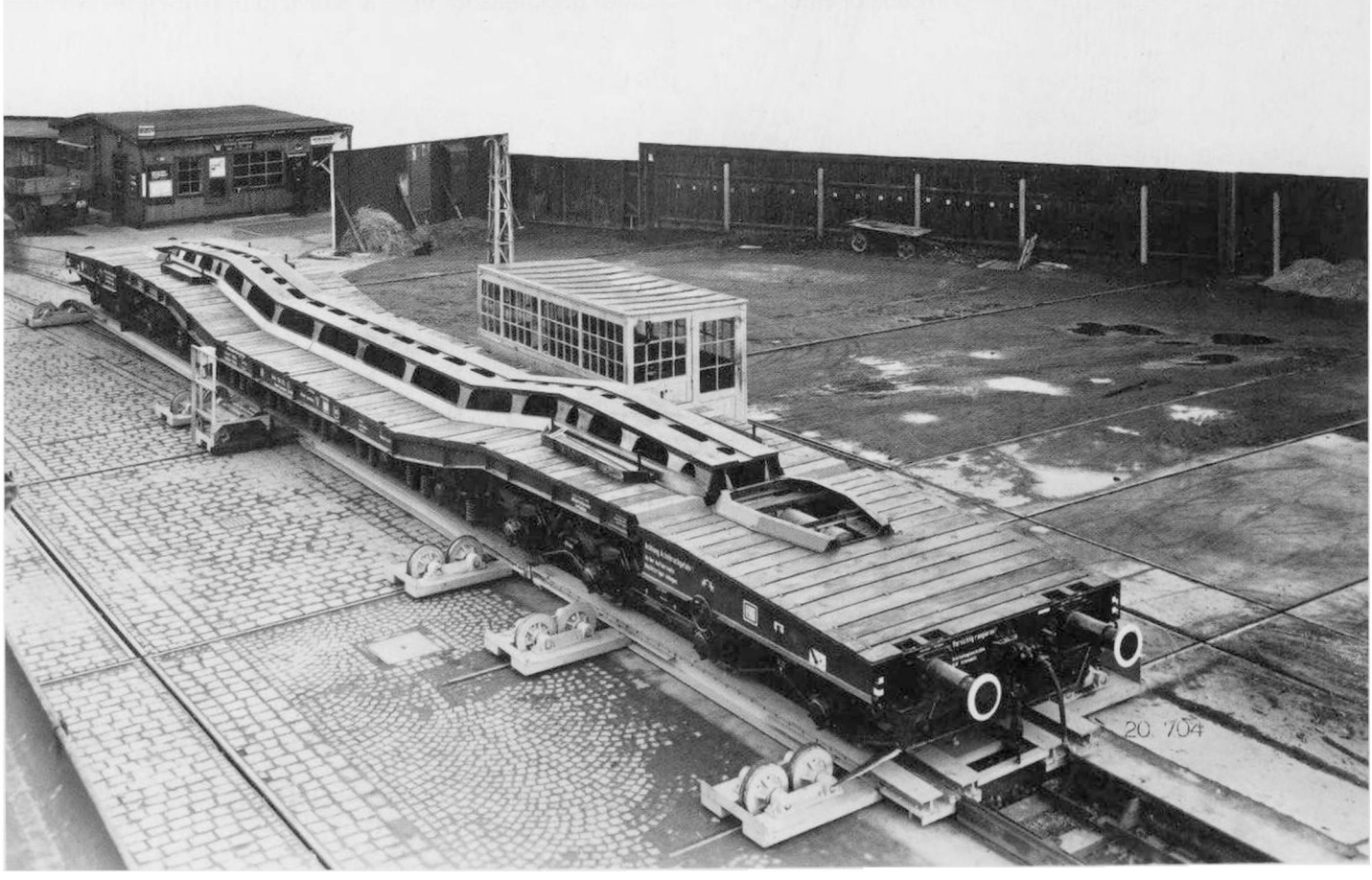
This dispute actually says everything about the meaningfulness of this project and the stubbornness of Hitler, but no one had the courage to speak the truth. For a close-in tank destroyer the Maus would have posed no problem, apart from somehow climbing the smooth two-meter-high [6.5 ft.] hull. In action these high sides would have even been a problem for the tank's crew, as there would have been no ladder available. Even with an incendiary device as a weapon, a hit in the middle area—the engine grating—would have achieved the desired result. Given the heavy armor all around, sticky mines and bundled hand grenades would have been less effective. The possibility of anti-aircraft defense was also to be looked into, either directly on the tank or in the form of a special anti-aircraft tank with 37 mm anti-aircraft guns, like the later *Flakpanzer* Panther Coelian. The supply of 128 mm ammunition was to be increased from 50 to 80 rounds. There were no doubts this would be achieved at the cost of reducing the 75 mm ammunition from 200 to 100 rounds. Installation of the flamethrower was abandoned, as was the commander's cupola. The same day Krupp was informed the openings in the rear of the hull were to be closed. The MG 151 anti-aircraft gun would be movable only in elevation, and the entire turret would have to be traversable for lateral aiming. Targeting would be by means of a separate telescopic sight. The design for a 20 mm MG 151/20 for air defense that was only movable vertically was also not pursued. Had it proved a success, this cannon would also have been planned for the Tiger and Panther. In its place, there was now space for the installation of a coaxial MG 34 to the left of the 128 mm KwK 44. The use of an anti-aircraft cupola on the aft part of the turret abeam the close defense weapon was considered, but the idea was dropped because of lack of space and the tight railway clearance diagram. There were also objections—not only from Gen. Guderian, who was demanding fast, maneuverable tanks—but also from the Army Ordnance Office about the high consumption of scarce copper. Porsche's chief engineer Karl Rabe was sent to the Friedrichshafen gear factory to examine the feasibility of an electromagnetic drive developed there. The director of the factory refused to release any information without a directive from the OKH, so



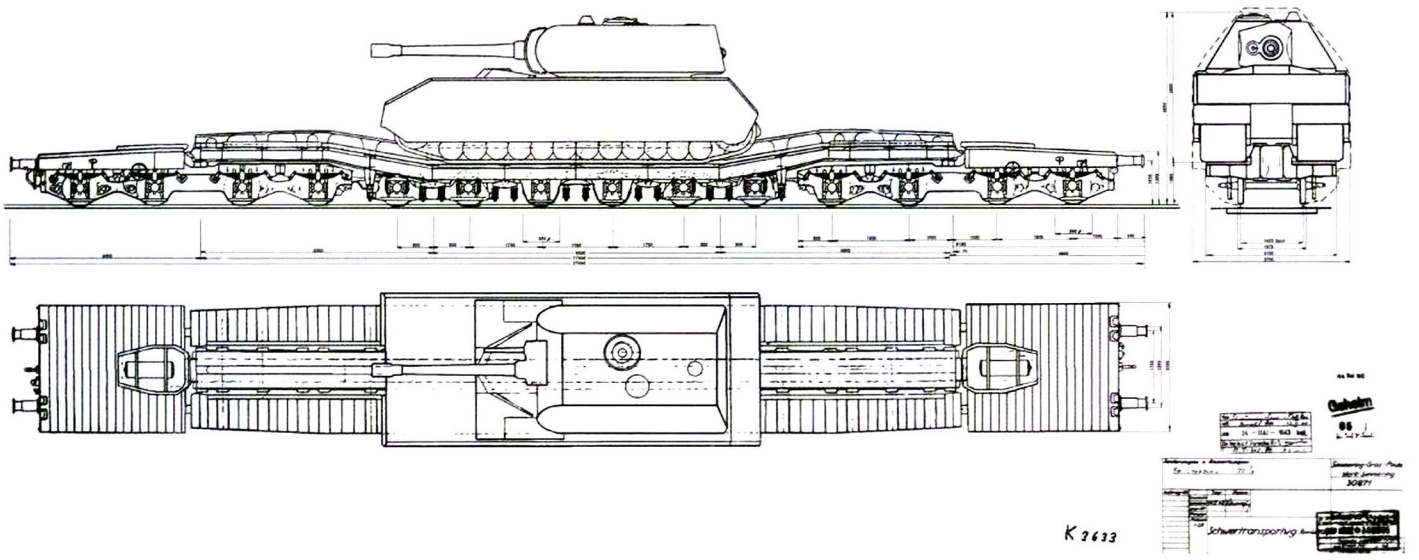
Design for a 20 mm MG 151/20 anti-aircraft weapon in the turret of the Maus.

they were left with Porsche's gasoline-electric drive. On May 24, 1943, Simmering-Graz-Pauker presented the 72.25-ton 14-axle *Spezialwagen* (special vehicle) ordered on March 21. Loaded, the 27-meter-long [88.6 ft.] heavy transport vehicle had a gross weight of approximately 255 tons. This was equivalent to an axle load of 18.8 tons on the chassis and 17 tons on the supporting bridge, or 9.35 tons per meter. This made it possible to use the railway network, because by then most rail lines in the German Reich had been upgraded to accept axle loads of twenty tons. Some steam locomotives—like the BR 1 with an axle load of 20 tons, the BR 41 at 19.7 tons, and the BR 42 at 17.7 tons—were already represented in this new load scheme. Special vehicles like the 600 mm "Karl" mortar, with a gross weight of 180 tons, had also been transported by rail with its weight spread over ten axles. The 380 mm "Siegfried" gun weighing 287 tons and 31.3 meters [102.7 ft.] long was transported on 16 axles, with an axle load of 17.7–18.2 tons, or 9.2 tons per meter. Contrary to popular belief, there were bridges that could support that load. The Spezialwagen also reached the allowable height for tunnel





S6P factory photo. *J.D. Collection*



Heavy transport wagon for the Type 205.

passages. Of the five vehicles ordered, three had already been completed and five more were planned as an option. The known Reichsbahn numbers were Stuttgart 918 799 and Berlin 918 392. These depressed center flatcars were also well suited to the Maus successor, the E 100 tank. Professor Porsche wanted to use the tank's electric drive to power an electric motor in the heavy transport by way of a long cable, so a locomotive would not be required in case of emergency. For reasons of time, the proposal for a self-powered vehicle was not pursued. The Reichsbahn Operations Center (RZA) also wanted to develop a wheel set that could automatically convert to other track gauges as soon as it drove onto a corresponding transition track. The gauge change was ultimately supposed to take place with so-called "axle compression." Additional wheel sets were developed for this purpose. In addition to the wheel set with 1,435 mm [56.5 in.] gauge (normal gauge), wheel sets with a gauge of 1,676 mm [66 in.] (Spanish gauge) were made, among others. The buffer distance could also be reset from normal to wide gauge. Wheel diameter was 850 cm [334.6 in.]. The bogies were curved and had a radius of 250 meters [820 ft.] under load or 150 meters [492 ft.] unloaded. The fifth and tenth axles had so-called transverse equalizing beams, and the fifth, sixth, ninth, and tenth axles were guided by longitudinal equalizing beams. Their purpose was to equalize axle pressures when the vehicle was moving and prevent derailments on uneven tracks. On May 26, 1943, the Reichsbahn issued the loading dimensions for the Maus hull with a maximum of 3,700 mm [145.6 in.] (it had previously been 3,700 mm [145.6 in.], less the tolerances). Later 15 mm excess was permitted up to the fourth vehicle. On the other hulls (numbers 5 to 13), the outer sidewalls had to be trimmed by 170 and 90 mm [6.7 and 3.5 in.]. From hull number 14, the plates for the sidewalls had to be rolled to 170 mm [6.7 in.] and the rest trimmed to 90 mm [3.5 in.] as before. An interesting aspect of the "tunnel profile" (see drawing) is the shape of the Maus cross section matched the tunnel shape. The developers had no wiggle room, i.e., to build sloping side armor to create a greater thickness for enemy shells to penetrate. How close the tolerances were can be seen from the manual, which specifies that the two exhaust end pieces were to be turned in during rail transport. Passing oncoming trains was also impossible.

Gunnery Trials

Welding work on the hull front sections destined for gunnery trials was completed on May 10 and 17, 1943, and they were sent to the army experimental station at Kummersdorf-Gut. One of the models was to have machined armor plates, while the other armor plates were oxy-fuel-cut or thermally treated. The Army Ordnance Office was not sure if thermally treated plates were less strong. The gunnery trials turret was also delivered to Kummersdorf-Gut on May 25, 1943, and first firing tests were to be carried out on June 5. A big problem suddenly arose; the turret could not be unloaded because the crane in Kummersdorf-Gut could only lift twenty tons. The transport was immediately redirected to the army proving grounds at Hillersleben. There the WaPrüf had better facilities, including a 150 ton gantry crane. Gunnery tests began at the army test station at Hillersleben on June 19, 1943, on the B-Platz (B = Berta), the 25,000 meter [27,340 yard] point on

the firing range. The army's first targets in the experiment were armor plates 200–250 mm [7.87–9.84] thick. WaPrüf 6 did not previously have time to conduct systematic testing of such strong armor materials. There were also no experimental values about firing army anti-tank weapons at the homogenous navy plates that were used. The Maus turret and the armored hull of a Ferdinand (StuK 43/1)—which was also shot at—were both full size. The combining of the thinner armor plates was done in the usual way with simple welding, while the thicker plates were welded together by means of dovetailing and tenon joints. Two processing variants of the hull sections were made: on one hull the dovetailing was mechanical, while the other was made with autogenic flame cut, with resulting greater tolerances. While dovetailing alone seemed too risky with such plate thicknesses, for the first time so-called shear bolts were also used. Two different versions were used: solid bolts and hollow bolts, or Hedtmann fasteners. The weld seams had been drawn inside and outside, and with a transverse weld section of about 40 mm [1.57 in.] were the biggest used in tank construction to date. Their durability under fire was to be tested. Of particular interest was whether the entire length of the weld seams would crack under large-caliber fire, making it necessary to alter the direction of the seams instead of making them straight. The Pak 40 and Pak 43 were used for the firing test. The ammunition used was 75 mm Pz.Gr.-Patr. 39 blank with a velocity of 750 m/sec [2,460 ft/s] and the 88 mm Pz.Gr.-Patr. 39-1 blank with a velocity of 1,000 m/sec [3,281 ft/s] at a firing range of 100 meters [328 ft.]. The designation "blank" meant the Teerspat explosive and detonator were replaced. The explosive in the armor-piercing shells was supposed to cause an explosion in the interior of the tank. For the test objective—determining the force of impact and behavior of the projectile during penetration of the armor—it was the shell's kinetic energy that was important, consequently, no explosive was needed.

1st Firing Pattern

Maus forward section, tempered version, forward section was welded with the highly alloyed electrode NCT 3 (Ni = 20%, Cr = 25%) after preheating to 60°C [140°F]. Due to its weight, the hull was not relaxed after welding. Shelled with 88 mm Pz.Gr.

Fire at the bow in the direction of travel (plate thickness = 204 mm [8 in.], firing angle = 38°).
Hit 1: No mark on plate and weld seam.
Hit 2: No mark on plate and weld seam.
Hit 3: on right edge of the tooth—no mark on plate joint: shear bolts ejected, tooth pressed outward 10 mm [0.4 in.], lower tooth weld seam cracked 100 mm [3.94 in.], inner unmarked.
Hit 4: on right corner of tooth at the edge of the shear bolt—no mark on plate, joint: seam around the shear bolt cracked length of 50 mm [1.97 in.], otherwise inside and outside seams unmarked.
Hit 5: 53° down middle—slight dent in plate with no crack, no marks on seams.

Fire from side, hull turned 35° to direction of travel and fire (plate thickness = 183 mm [7.2 in.], firing angle = 35°).
Hit 6: no marks.
Hit 7: on outer 180mm [7.1 in.] sidewall, 100 mm [3.94 in.] next to tongue with no marks, no marks on outer and inner seams, 50-mm-long [1.97 in.] crack in outside seam between tooth and shear bolt, no mark on inside seam.

2nd Firing Pattern

Maus forward section, mechanically processed; the forward section was welded with an electrode usually used for tank welding, the Zeus V10A (Ni = 7.75%, Cr = 19.5%). Resulting cracks were re-welded with electrodes NCT 3 and V4A (Ni = 9.5%, Mo = 2.5%, Cr = 17.5%) after preheating. Shelled with 88 mm Pz.Gr.

Fire at the bow in the direction of travel (plate thickness = 204 mm [8 in.], firing angle = 30°).
Hit 1: no mark on plate or weld seam.
Hit 2: No mark on plate or weld seam.
Hit 3: 300 mm [11.8 in.] next to right edge, 150 mm [5.9 in.] next to the tooth—no mark on plate, joint: 100mm [3.94 in.] crack in tooth seam, 200 mm [7.87 in.] crack in upper tooth seam with extension of the seam around the shear bolts, no mark on inside seam.
Hit 4: 100 mm [3.94 in.] next to Hit 1—slight dent in plate with no crack, edge sheared outward distance equal to caliber, shear bolts sheared off, joint: 200-mm-long [7.87 in.] crack in seam around the tooth at the edge of the seam, otherwise no marks on inside seam.
Hit 5: 58° down middle—slight dent in plate with no crack, lengthwise crack at the edge of the upper edge of the tooth from Hit 4 extended by 250 mm [9.84 in.], 500-mm-long [19.7 in.] crack on edge of inside seam.

Fire from side, hull turned 35° to direction of travel and fire (plate thickness = 183 mm [7.2 in.], firing angle = 35°).
Hit 6: at edge of tooth—no marks on plate, joint: outside

seam cracked 50 mm [1.97 in.] from edge to the shear bolts, 100 mm [3.94 in.] crack in seam at upper tooth, inside cracked 200 mm [7.87 in.] at edge of seam and lengthwise 150 mm [5.9 in.].

Hit 7: on outer sidewall 100 mm [3.94 in.] plate, punching holes bent up 15 mm [0.59 in.], in forward part 15 mm [0.59 in.] outwards, resulting in 450 mm [17.7 in.] crack in outside and 600 mm [23.6 in.] crack in inside seam.

Hit 8: on inner sidewall with 80 mm [3.15 in.] plate: clean penetration, seam around the tooth cracked all around, longitudinal seam cracked entire length.

Hit 9: on threaded plug in sidewall—180 mm [7.09 in.] plate, threaded plug blown inward, otherwise no marks.

3rd Firing Pattern

Maus turret; the turret shell was welded with electrodes Zeus V10 and NCT 3 with preheating of 60–70°C [140–158°F]. Resulting cracks were repaired by re-welding with electrode V 4A. Because of its great weight, the turret shell was also not relaxed after the welding. Shot at with 88 mm Pz.Gr.

Fire at turret front (thickness = 236 mm [9.29 in.], firing angle = 72°) in direction of travel.

Hit 1: Plate—dent with no crack, no marks on seams.

Hit 2: like Hit 1 80° low, no marks on plate or seams.

Hit 3: like Hit 1 90° low, no marks on plate or seams.

Hit 4: like Hit 1 43° low on right upper corner 150 mm [5.9 in.] from edge, no marks on plate, outside seam 550-mm-long [21.65 in.] lengthwise crack at edge of seam, upper corner pushed outward 10 mm [0.394 in.], seam around the shear bolt cracked, no mark on inside.

Fire from the side, shell turned 60° to direction of travel and fire (thickness = 205 mm [8.07 in.], firing angle = 55°).

Hit 5: 70° low on upper corner of tooth, penetration, shear bolt ejected, outside seam cracked 600 mm [23.6 in.] from shear bolt, inside clean penetration, hit caused 300mm [11.8 in.] crack downwards at the edge, inside both adjacent seams cracked 60 mm [2.36 in.]. Note: the penetration was apparently due to a weakening in the material caused by overlapping shear bolts.

Hit 6: at butt joint, clean penetration, outside 450 mm [17.7 in.] lengthwise crack at the edge of the seam to the lower shear bolt, inside hit caused 80 mm [3.15 in.] downward crack at the edge of the seam.

Hit 7: at butt joint, slight dent in plate with crack (no daylight), projectile lodged, shear bolt ejected outward, outside, hit caused 250mm [9.84 in.] and 200mm [7.87 in.] cracks at the edge of the seams, inside hit caused 80-mm-long [3.15 in.] crack downward at edge of seam.

Hit 8: on plate, dent with no crack, no marks on inside or outside of seam.

Hit 9: 75 mm AP at 100 meters [109.4 ft.] on the lower edge of the turret side, plate: no marks, 100- and 300mm [3.94 and 11.8 in.] cracks on outside edge of seam, inner seam of the supporting plate cracked 200 mm [7.87 in.].

In summary, the final report found:

> he 200- and 250mm [7.87 and 9.84 in.] armor plates manufactured from steel with approximately 2.35% Cr, 0.25% Mo, and 3.2% Ni with a strength of 80 kg/mm² [113,787 lbs/in²] in the center as SM steel, were fired at with roughly anticipated accuracy. It was found they were safe against 88 mm Pz.Gr. 39-1 AP rounds (from Pak 39) to 200 mm [7.87 in.] at a distance of 100 meters [109.4 ft.] and an angle of 58°, and to 240 meters [262.5 ft.] at an angle of 90°. Available navy plates, which had previously not been tested against anti-tank weapons, were used on the three Maus armored components. The plates were not tested to penetration, as the plate thicknesses would have required a larger caliber than 88 mm that was not available during the experiment [in Hillersleben, author]. The armored component edge bonds performed flawlessly, and no major differences between mechanically-made and autogenous-welded edges were found. In the Maus turret, the join between the front wall (Position 1) and side panel (Position 2) was not perfect, as apart from the dovetailing, the metal pieces merely butted against each other and the presence of the shear bolts created additional weakening of the material in places so penetrations were possible. WaPrüf 6 is asking Krupp and Porsche to submit new proposals for this join. The join between the sidewall and turret supporting plate appears to be inefficient. The companies are also being asked to make new suggestions for this join. The practicality of the shear bolts has been proven, but their number is to be limited to what is absolutely necessary. Length of the bolts is to be assumed at about 2⁄3 to ¾ of the metal thickness. The plates must not be bored all the way through. Generally, the cracks in the weld seams caused by fire were not unusually long; rather, they remained within expected limits. It therefore appears unnecessary to make longer seams in zigzag shape as when inlaying the roof plates into the sidewalls on the Maus turret.

A continuous seam is sufficient and will simplify production considerably. (Record of Maus test results from 6/19/1943, WaPruf 6, on 12/07/1943)

As the 122 mm D-25T gun of the Russian IS-2 heavy tank does not come close to matching the performance of the 88 mm Pak 43 L/71 used in the trials, it can be assumed the IS-2 would not be able to penetrate the armor of the Maus from the front nor the side, nor from the rear. In comparison, using the BR-471B armor-piercing round, the Russian 122 mm D-25T is able to penetrate 122 mm [4.8 in.] of armor plate at a firing angle of 60° and a range of 500 meters [1,640 ft.], while the Pak 43 with 39-1 armor-piercing ammunition can penetrate 185 mm [7.28 in.] of armor steel. The only weak spot in the turret armor is the joint between the front wall and side plate, for apart from the dovetails, the plates simply butt against one another, and the overlapping shear bolts cause further weakening of the material. The weak spot was identified after evaluation of the firing tests, and it was decided to restrict the so-called shear bolts to a minimum and not drill through the plates. But they could not be done away with entirely, because the weld seams of the thick plates hardly had a holding function. At a meeting in Stuttgart on May 21, 1943, it was determined the weld seam must be seen primarily as a seal. The 40-mm-thick [1.57 in.] weld seam was the maximum weldable (see the result of blowing up a Maus 205/2 on April 20, 1945, p. 46). Also discussed was the bulged shape of the turret's forward face, which deflected shells striking the lower part of the turret wall, they did not remain stuck into the turret ring, potentially causing jams. Justification for this configuration can be found in the minutes of this conference:

Based on experience gained in the previous construction of fortifications, turrets with such wall thicknesses, which are not made of metal sheets welded together, but which instead are assembled from thick armor plates, require very special joints. Such armor plates cannot be pressed or bent into any shape or assembled from many small armor plates to achieve turrets with broken corners. Based on this experience, the Maus' turret is assembled from a few plates of simple geometric shape and the plate joints are attached by dovetails and bolts. This allows the whole to form a self-load-bearing design in which the weld beads are seen mainly as seals and not as plate joints. AK [Krupp's artillery design department] does not see so great a danger in the present form of the turret face, because the majority of hits from the front will either be deflected upward or become lodged in the armor plate and will only be deflected downward by the lower plate strip. The lodged shots pose the main danger, as their explosion will often stave in the weak and often perforated top surfaces of the vehicle (grates), while dislodging of the turret is unlikely due to its great weight (51.5 tons). For technical reasons it is strongly advised that a complicated shape from several small plate sections not be considered. Should the turret wall be significantly altered, however, a change will have to be made to a cast turret front section. For the current series of Maus a transverse shell-deflecting strip—like a fender—could be added in front of the turret. (Krupp transcript 5/24/1943)

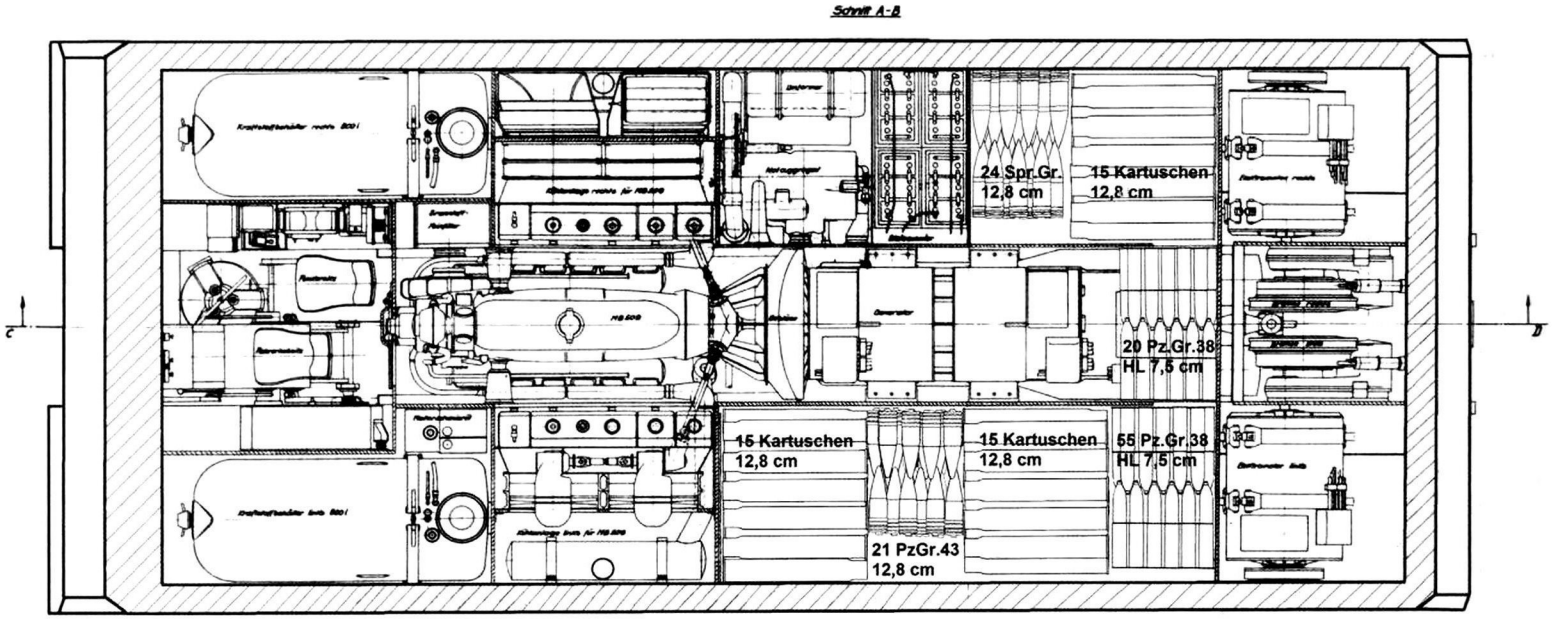
Weakening of material through shear bolts.

In this context, the turret must be called Maus II, which is described later. At a meeting held by the Army Ordnance Office on July 23, 1943, it was clear the MB 509 gasoline engine was only an interim solution and that a 1,500–1,800 hp diesel engine was needed. Daimler-Benz then offered the MB 507 12-cylinder light diesel engine, this time with supercharging. Now called the DB 517, the engine had an output of 1,200 hp at 2,400 rpm and an identical displacement of 44.4 liters [11.73 gals]. Weight was only 820 kg [1,808 lb.], and it had a weight-to-power ratio of 0.68 kg/hp [1.5 lbs/hp]. By comparison, the 700 hp (later reduced to 650 hp) Maybach HL 230 12-cylinder gasoline engine without fittings weighed 750 kg [1,653 lb.], which is equivalent to a weight-to-power ratio of 1.07 (later 1.15) kg/hp [2.36 and 2.54 lbs/hp]. It was

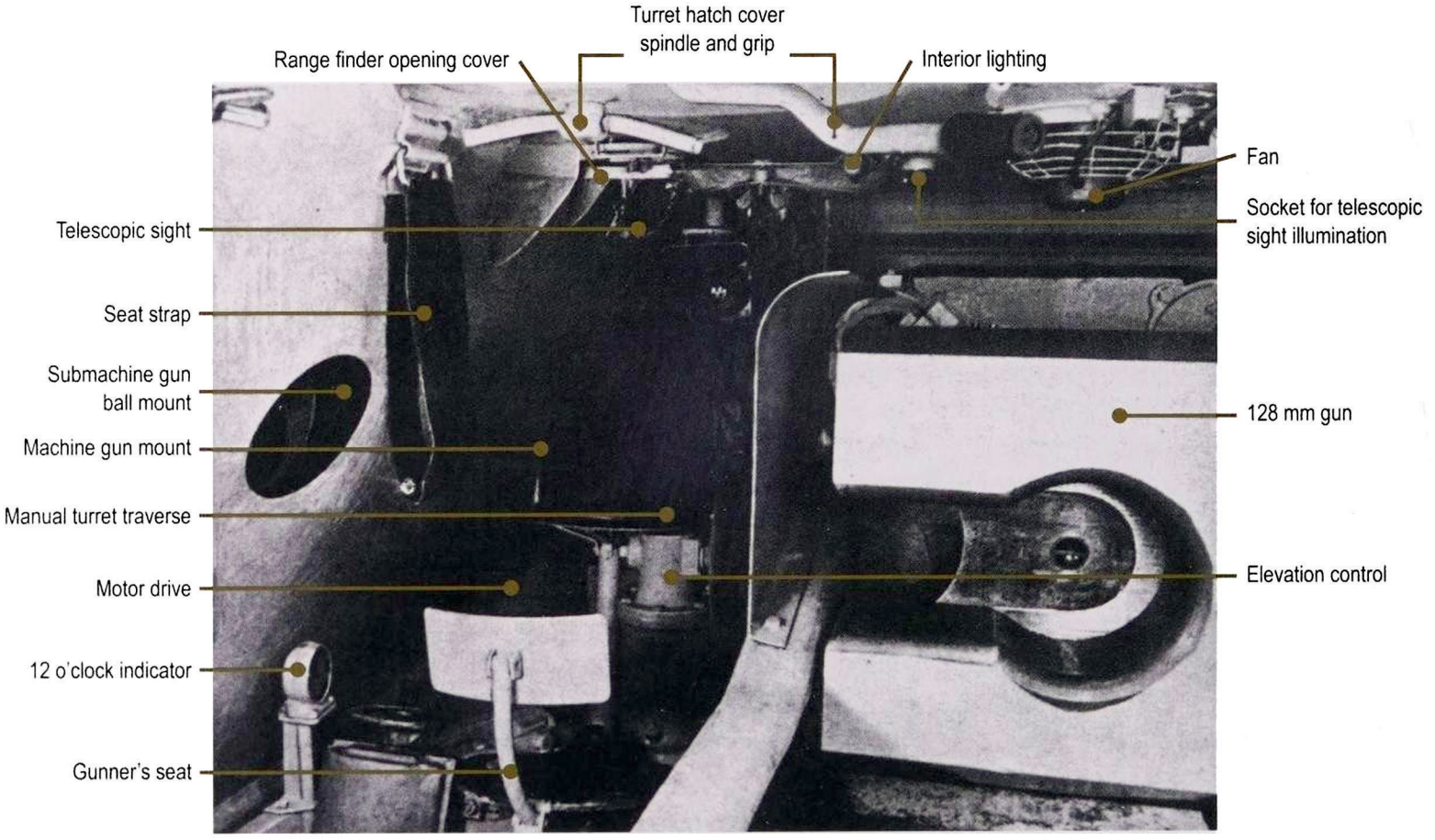
the standard engine in the German Panther and Tiger heavy tanks. One must bear in mind that, because of their high combustion pressures, these engines are generally heavier and more massively built. In principle, the DB 517 was of identical design to the MB 509 gasoline engine, except it could be built "the right way round," eliminating the need for intermediate gearing. The Army Ordnance Office found the performance adequate and ordered two MB 517 engines from Daimler-Benz. Cost per engine was 125,000 RM. In comparison, a Tiger I tank cost the armed forces 250,000 RM, and a Panther tank 117, 000 RM. The second prototype was to be equipped with this engine. Meanwhile, the MB 509 12-cylinder gasoline engine was run on the test bench in Daimler-Benz Factory 60 in Untertürkheim by Professor Kamm (Stuttgart Technical University) without problems from April 9 to August 9, 1943. The goal was to convert the DB 603A aero-engine to ground operation. The most important condition was the conversion from 87 octane fuel to 74 octane. Output was to be 1,200 to 1,300 hp.

The full-scale wooden model of the turret was completed by Krupp in Essen on April 22, 1943. On April 30, 1943, it was destroyed by fire during a bombing raid on the city. The second model was likewise destroyed by fire on May 27, 1943. The third wooden model, completed on June 30, 1943, was the first that could be used for study (price of a wooden model: 16,391 RM). It was found that, despite its external size, conditions for the turret's four-man crew were cramped. The long 128 mm cannon divided the turret interior in two. The commander's space was initially on the right side of the turret behind the loader for the 75 mm gun, but this got in the way when loading the 128 mm gun's two-part ammunition, as the reserve ammunition was stored behind him (2 × 12 rounds). The ammunition was further divided: the rest of 45 cartridges were stored in groups of fifteen in the left and right sides of the hull. Their projectiles were distributed in the left and right sides of the hull (21 and 24). Twenty-five rounds of 75 mm ammunition were stored forward on the right side of the turret, 55 rounds in the left side of the hull, and the remaining 20 rounds in the rear part of the hull beneath the revolving turret platform. Two-thirds of the ammunition for the guns was in the lower left area, as the Type 141 auxiliary power unit with its four batteries and so-called "Dräger Unit" for producing positive pressure inside the vehicle (this was only planned for the six prototype vehicles) were located on the right. The commander was repositioned behind the gunners. Instead of the planned revolving periscope, he had to use the vertical one-meter [3.28 ft.] Zeiss range finder for battlefield observation. This was retracted when the vehicle was moving and attached to the inside wall of the turret. For seating, like the loaders, he had to get by with a seat strap, as a fixed seat would have excessively restricted movement.

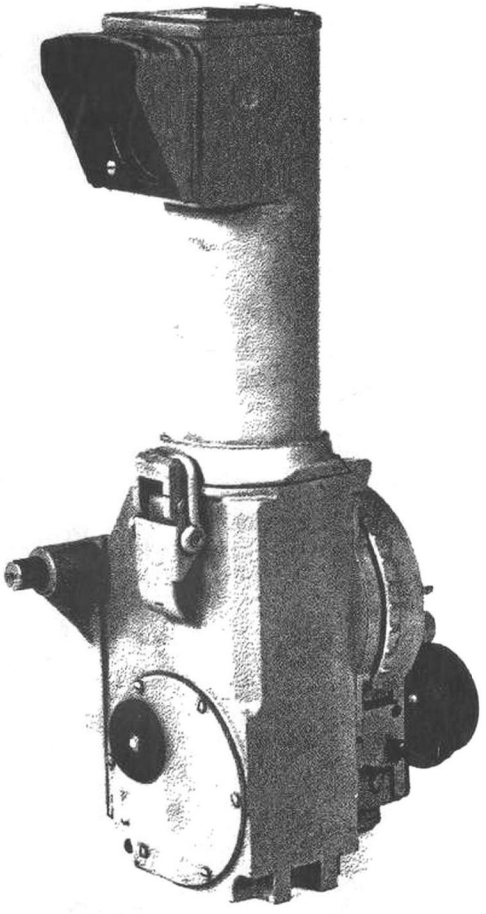
An exhaust compressor for removing powder gases after the 128 mm gun was fired was mounted on the revolving platform. It was manufactured by Himmelwerke AG of Tübingen and was powered by a DC motor producing 1,000 watts and 48 volts at 6,000 rpm. WaPrüf 6 specified instead of the planned revolving periscope (T.Rbl.3). Because of the projectile's high initial velocity, almost direct aim could be taken at the target at less than 1,200 meters [3,937 ft.]. From 2,000 meters [6,562 ft.] increased height was necessary, as the ballistic curve increased. To precisely determine this value, the range finder was indispensable for an accurate first shot. The opening in the prototype turret for the commander's revolving periscope was sealed. For space reasons, a horizontal range finder was not possible and was not envisaged until the later Maus II turret. The gunner operated the angled telescopic sight (TWZF 1) and for close-in defense had a coaxial MG 34 to the left of the 128 mm gun with 1,000 rounds of 7.92 mm ammunition in two special armored ammunition boxes as used by fortress pioneers. Because of the shape of its barrel jacket, the modern MG 42 initially planned fit poorly into the cutout in the turret's 240 mm [9.45 in.] frontal armor. The jacket of the MG 42 would first have to be redesigned, or else the machine gun would have protruded too far into the turret space and would be in the gunner's way. The MG 42 was of more robust construction, was easier to manufacture, and had a very high rate of fire (1,500 rounds per minute). The MG 34 moved with the main gun. The main gun's angle telescopic sight was used for aiming. The 128 mm KwK's 960 mm [37.8 in.] recoil had to be taken into consideration, as the gun had no muzzle brake to reduce recoil. Special value was placed on using a gun with no muzzle brake, because for the time being the planned sabot ammunition for maximum armor penetration could only be fired from barrels without muzzle brakes. The turret absorbed the high recoil forces, as it was prepared for the even more powerful 150 mm KwK L/38. This would have required a muzzle brake. With the aid of the 7.5-kW electric traverse motor, the turret traverse mechanism was able to rotate the turret 360 degrees in 45 seconds. By comparison, it took ten seconds for the Russian T 34 tank to make a complete rotation, while the KV I took 30 to 40 seconds, the Tiger 25 to 60 seconds depending on engine revolutions, the Panther Ausf. D 60 seconds, and the Panther Ausf. A 15 seconds at maximum engine rpm (but as revolutions were later restricted to 2,500 rpm, at least 18 seconds), while it took American



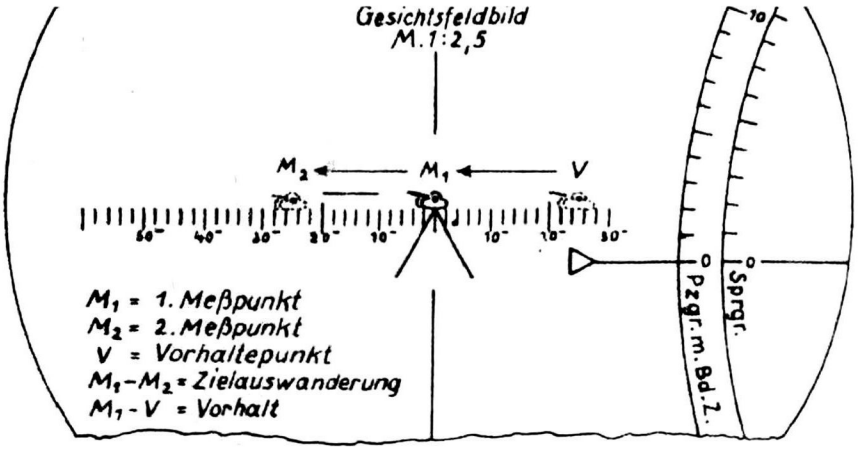
This drawing shows the distribution of ammunition inside the Maus.



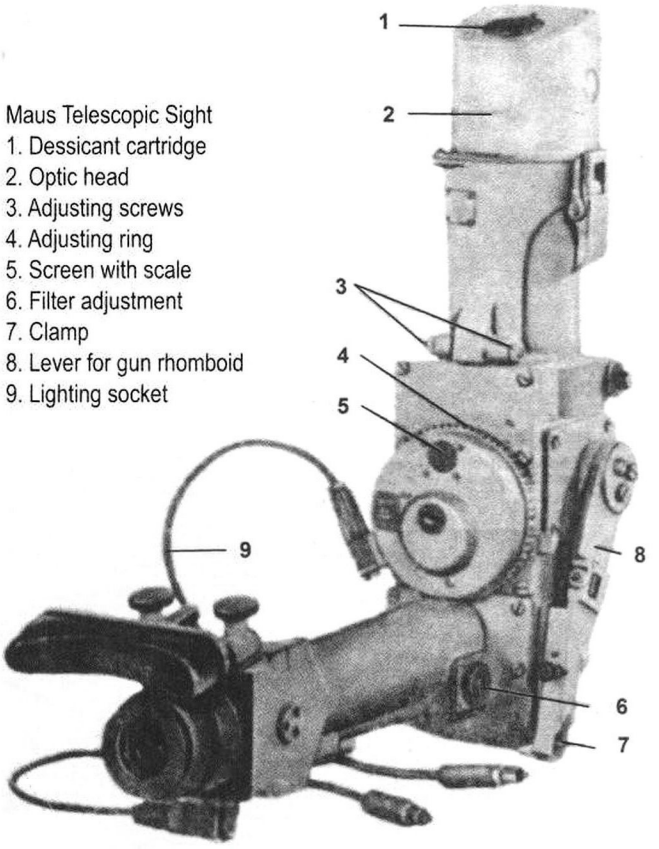
The fixed gunner's seat with elevation and azimuth controls and the WZF 1 angled telescopic sight. Left: the machine gun opening and the "12 o'clock indicator" (used to orientate the crew as to the turret's position relative to the hull). It was also on the right side of the turret. On the side of the turret is the commander's seat strap and above it the hatch in the turret roof.



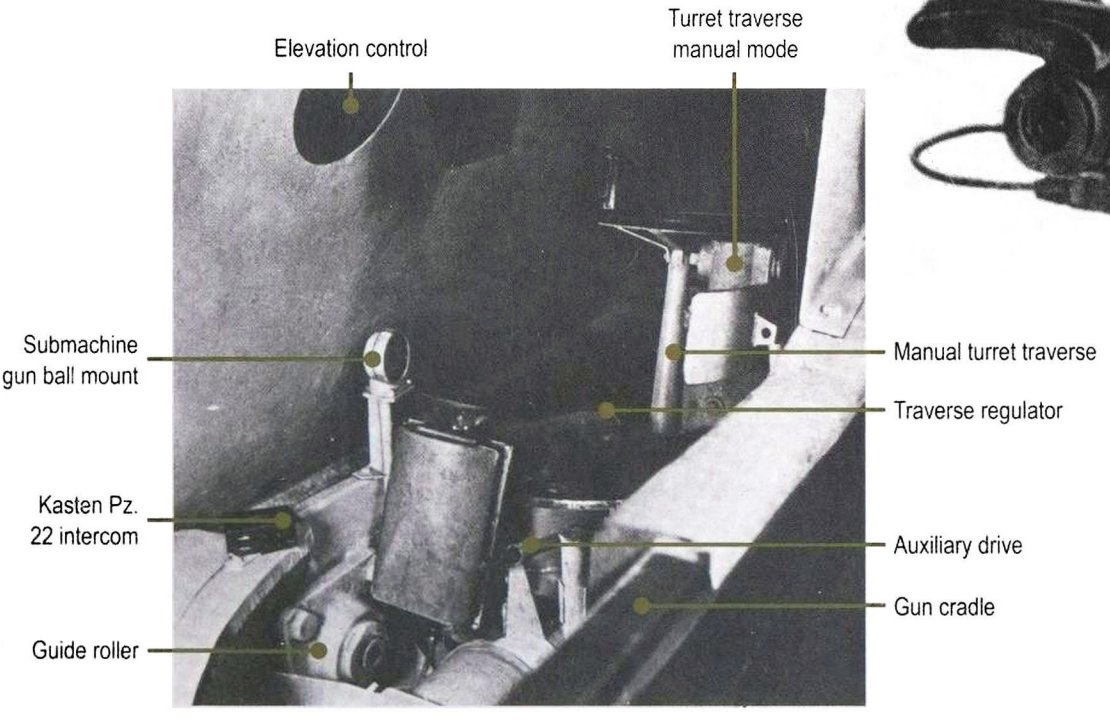
The angled telescopic sight



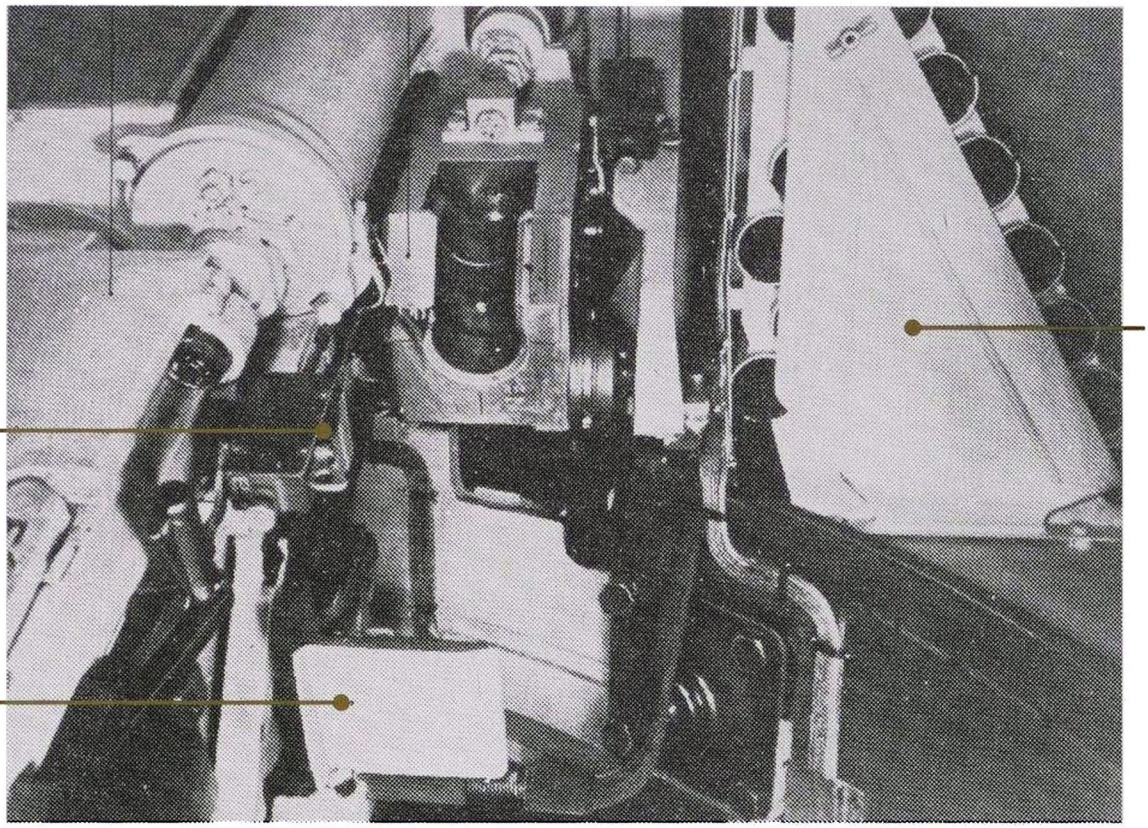
View through the angled telescopic sight with lead indicator—status as of January 1945. It had 10X magnification and a field of view of 122 meters [400 ft] at a range of 1,000 meters [1,094 yards].



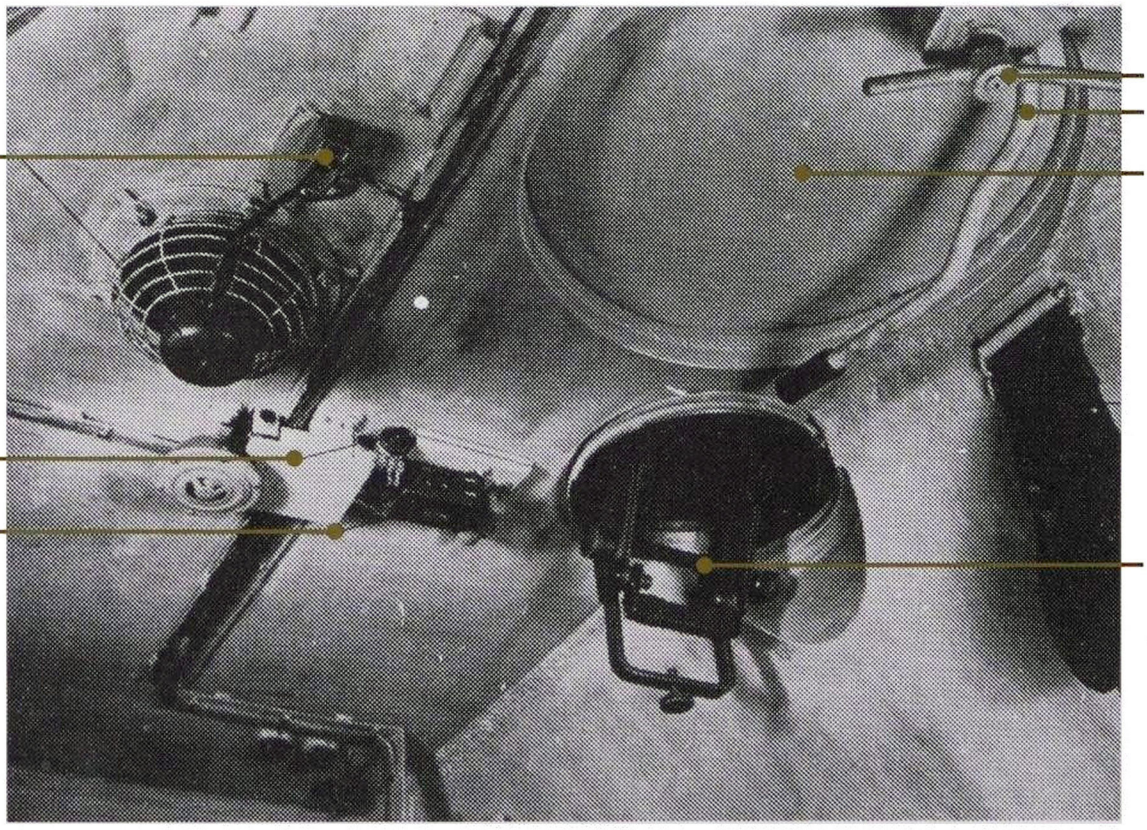
Maus Telescopic Sight
1. Dessicant cartridge
2. Optic head
3. Adjusting screws
4. Adjusting ring
5. Screen with scale
6. Filter adjustment
7. Clamp
8. Lever for gun rhomboid
9. Lighting socket



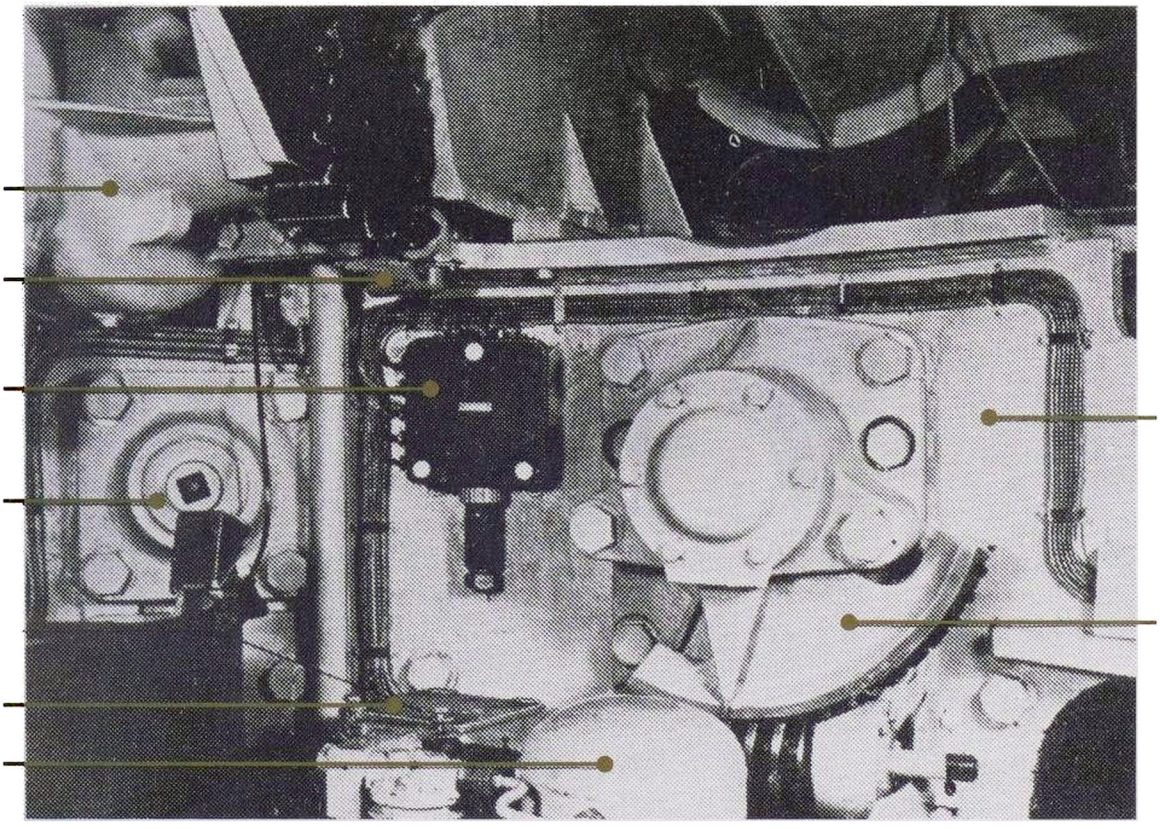
Azimuth and elevation control

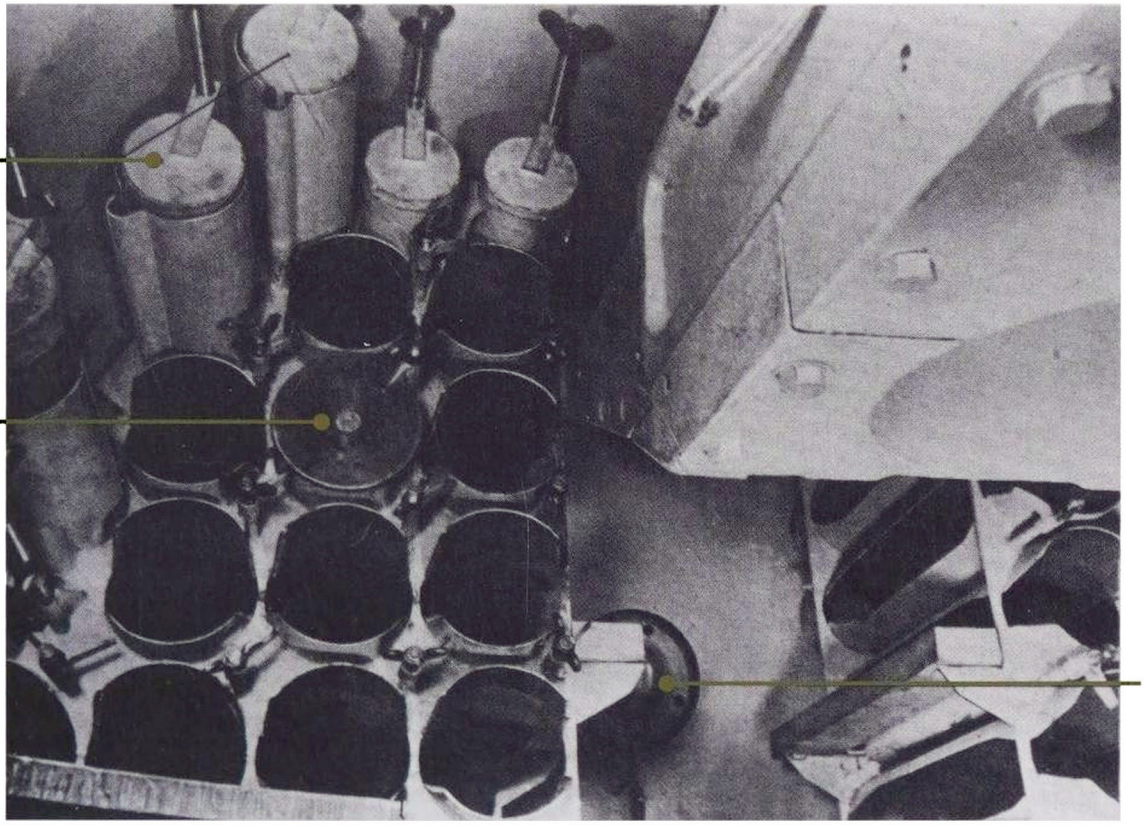


The position of the two loaders on the right side. The safety switch for the guns was supposed to prevent inadvertent firing. The deflector limited the distance shell casings were ejected from the breech.

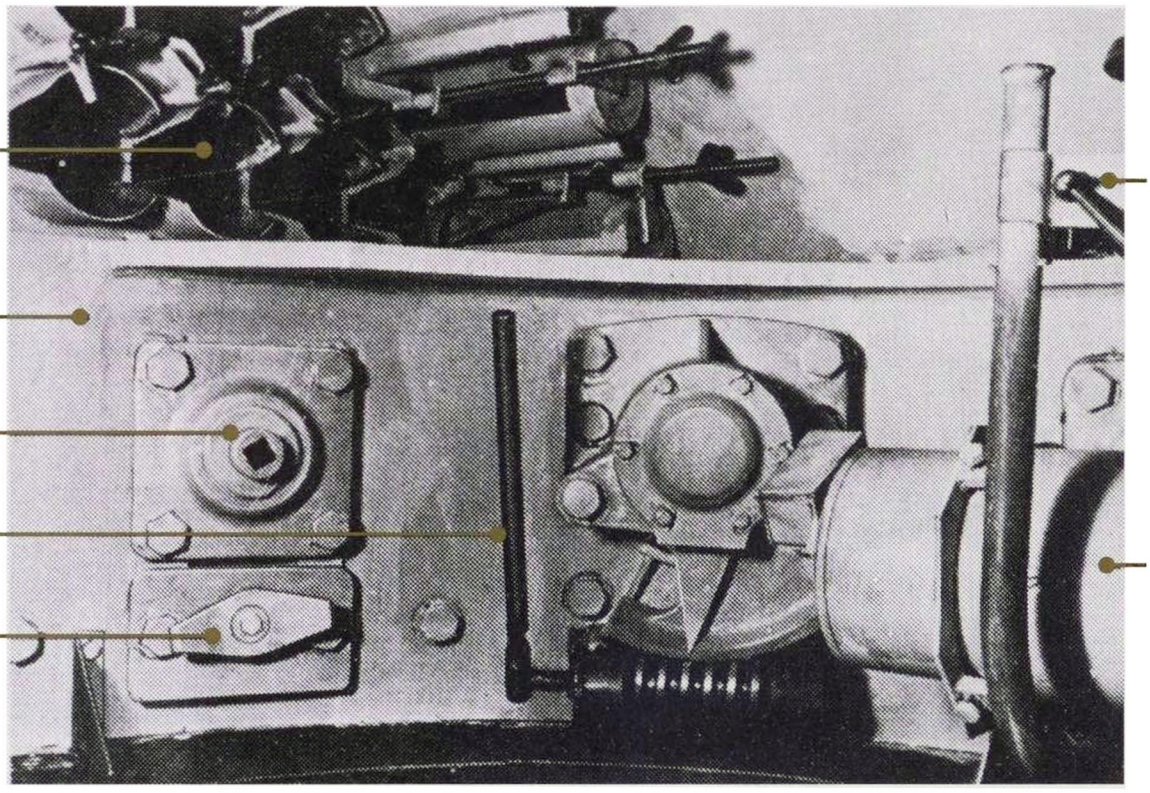


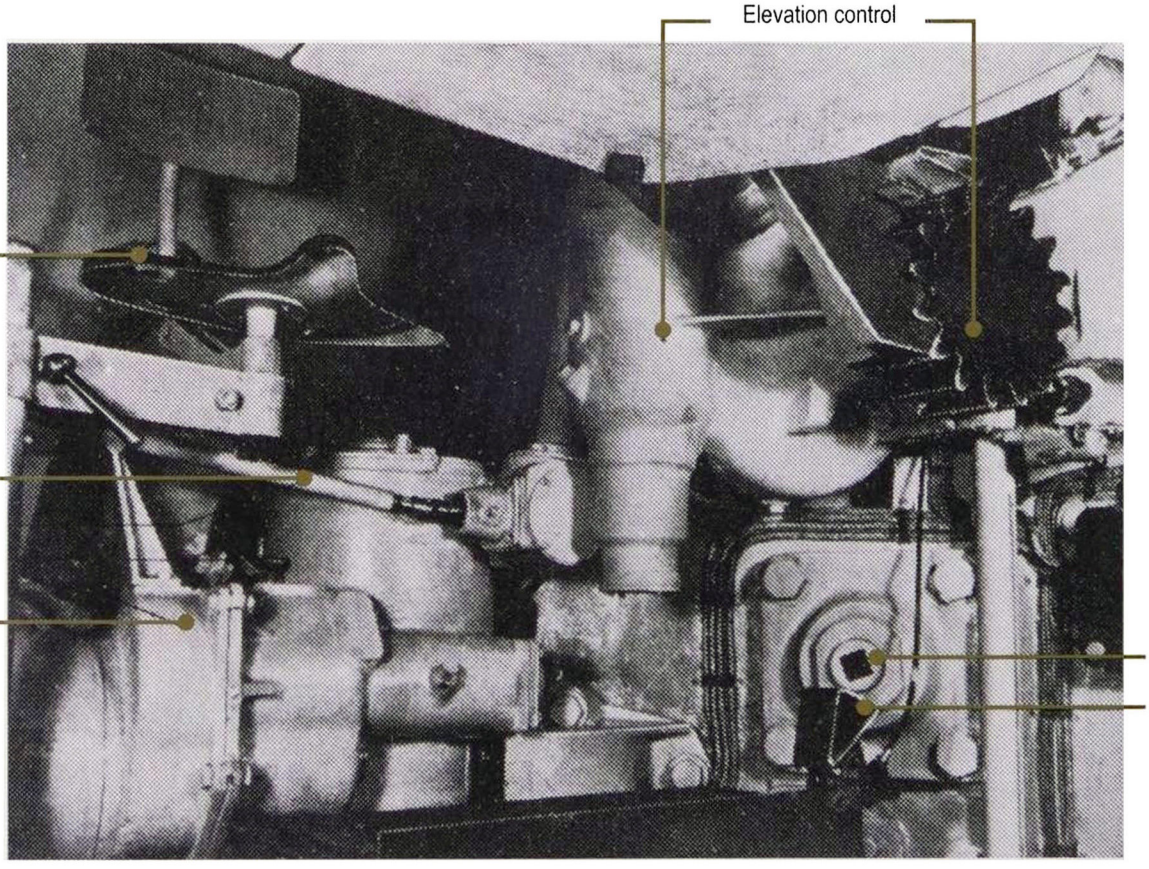
For battlefield observation, the loaders had a revolving periscope. There were also two Type GH 2/40 12 Volt built-in fans in the turret roof that could only be switched on in unison. If the intercom between the driver and commander failed, communication could be maintained with the aid of a 12 Volt emergency signaling system (two horns and lights).



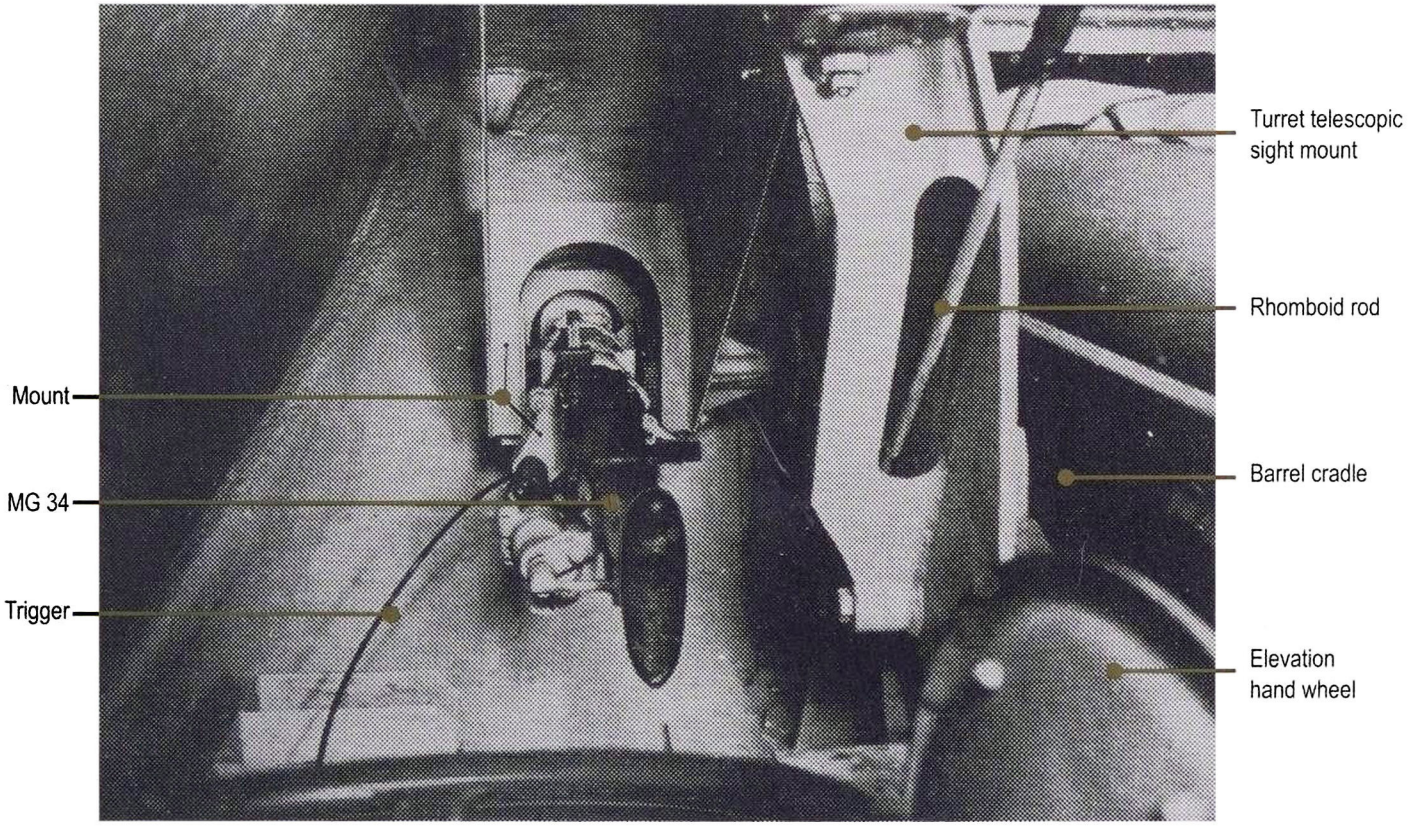


The two ammunition racks, each for twelve cartridges and shells for 128 mm reserve ammunition. Outside are the tubes each for two shells one behind the other; the others are for cartridge casings. Above right is the 128 mm KwK 44 from below. In the background is the ammunition loading hatch. It can be seen that the loaders had little room to maneuver. The close defense weapon above between the ammunition racks is also really inaccessible.

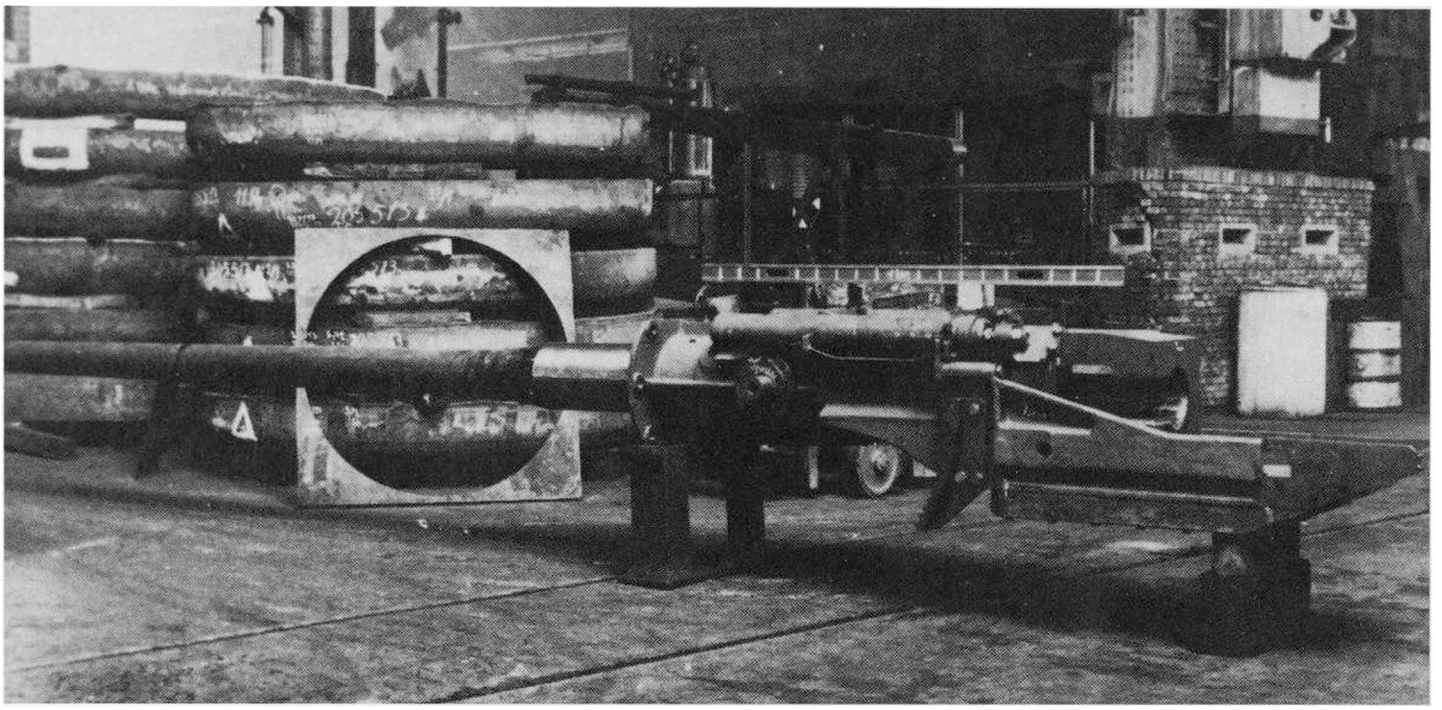

128 mm ammunition storage
Bearer ring
Guide roller
Raising system
Turret lock
Gunner's seat
Turret traverse mechanism


Elevation control
Gunner's seat
Turret traverse auxiliary power unit and gear change button
Guide rollers
Machine gun firing button

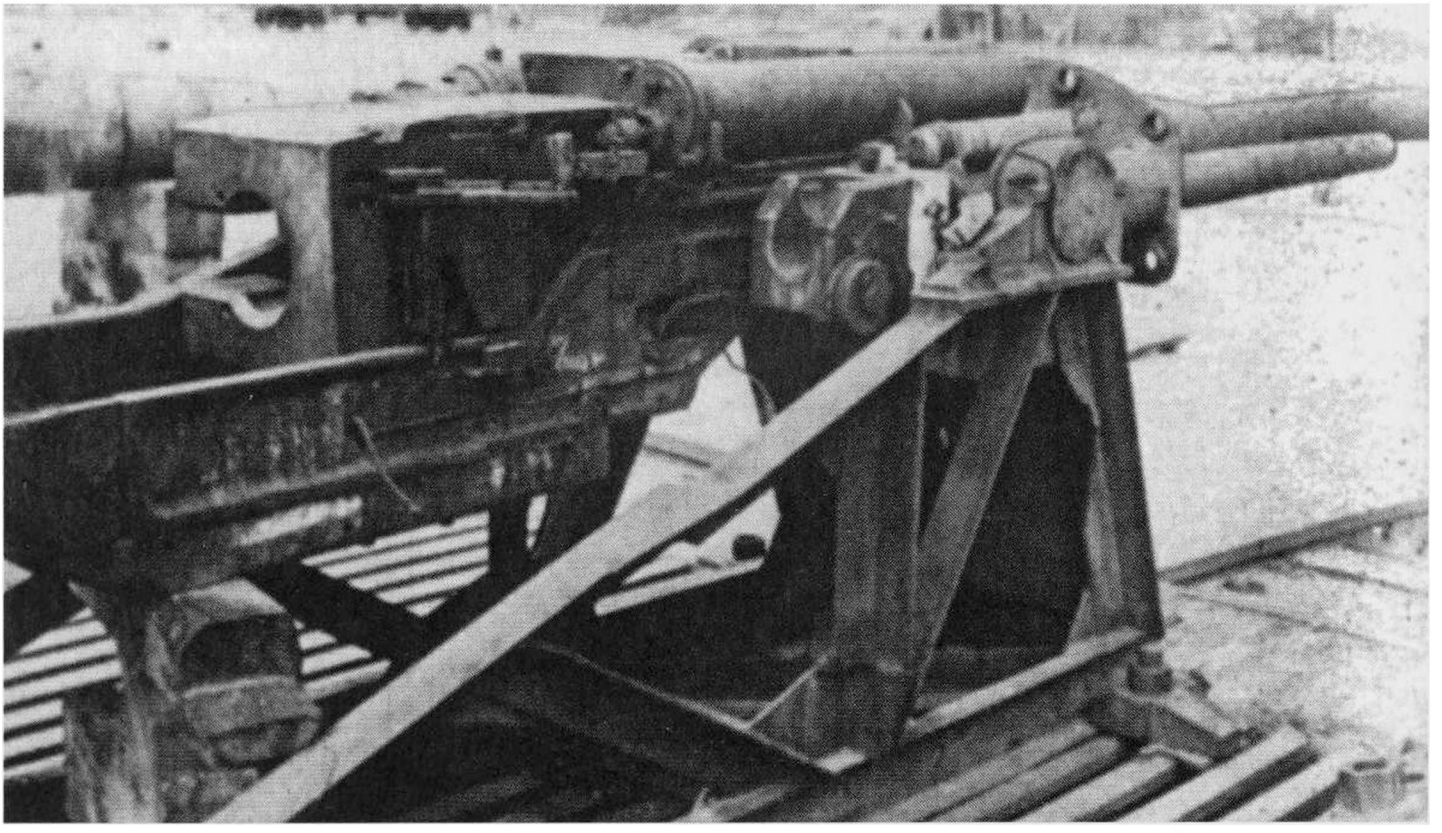
tanks 15 seconds for a 360-degree revolution. A total of 150 examples of the 128 mm KwK 44 were built. It was subsequently designated *Panzerjägerkanone* Pjk 44 and later 128 mm Pak 80, and was installed in 84 Sd.Kfz.186 Jagdtiger tank destroyers (four Jagdtiger were armed with 88 mm guns). The rest were mounted on captured chassis. The entire order comprised 584 guns, but it was never delivered in these numbers. In the twin cradle, the 75 mm KwK L/36, with the breech of the proven 75 mm KwK 37 L/24 (used in the Panzer IV, among others), was designated 75 mm KwK 44 ("Maus"). The 75 mm KwK 44 was mainly supposed to fire existing *Panzergranatpatrone* 38 HL ammunition, which could also be used as a high-explosive round if necessary. Adjustment fire with the 75 mm gun was conducted in Meppen from September 14–24, 1944. Muzzle velocity (Vo) was 431 m/s [1,414 ft/s] with a tolerance of +4.2 m/sec [13.78 ft/s] and -1.4 m/sec [-4.59 ft/s]. Special ammunition was also projected for this weapon: armor-piercing 75 mm flechettes L/8.9, 75 mm flame projectiles, and 75 mm shells. Two part ammunition was envisaged for the 128 mm KwK 44: the 128/75 mm sabot projectile designated *Sondergeschoss* (special projectile - outer cage diameter / inner core diameter) weighing 9.3 kg [20.5 lb.] or the 128/65 mm TS L/4.8 high-explosive round weighing 7.6 kg [16.75 lb.]. Both had nose fuses. After the shell left the muzzle the guide ring was jettisoned. Because of the smaller cross section and mass, muzzle velocity (Vo) was 1,260 m/s [4,134 ft/s] and the projectile was capable of penetrating 250 mm [9.84 in.] of armor at a range of 1,000 meters [3,281 ft.]. Performance was similar to the *Panzergranate* 40. It had a sub-caliber hard metal core. On impact, the projectile case remained stuck in the armor plate and the hard core penetrated the armor due to its great kinetic energy. The project was not pursued because the hard core was made of tungsten. Performance of the conventional 128 mm PzGr 43 was more than adequate. The full-caliber armor-piercing 128 mm PzGr 43 used charge L/4.4, weighed 28.3 kg [62.4 lb.], and had a muzzle velocity of 940 m/s [3,084 ft/s], which was later reduced to 925 m/sec [3,035 ft/s]. There was also the HL/C 39 hollow-charge round weighing 19.5 kg [42.99 lb.]; the 128 mm high-explosive round with nose fuse



Coaxial MG 34 machine gun in its mount.



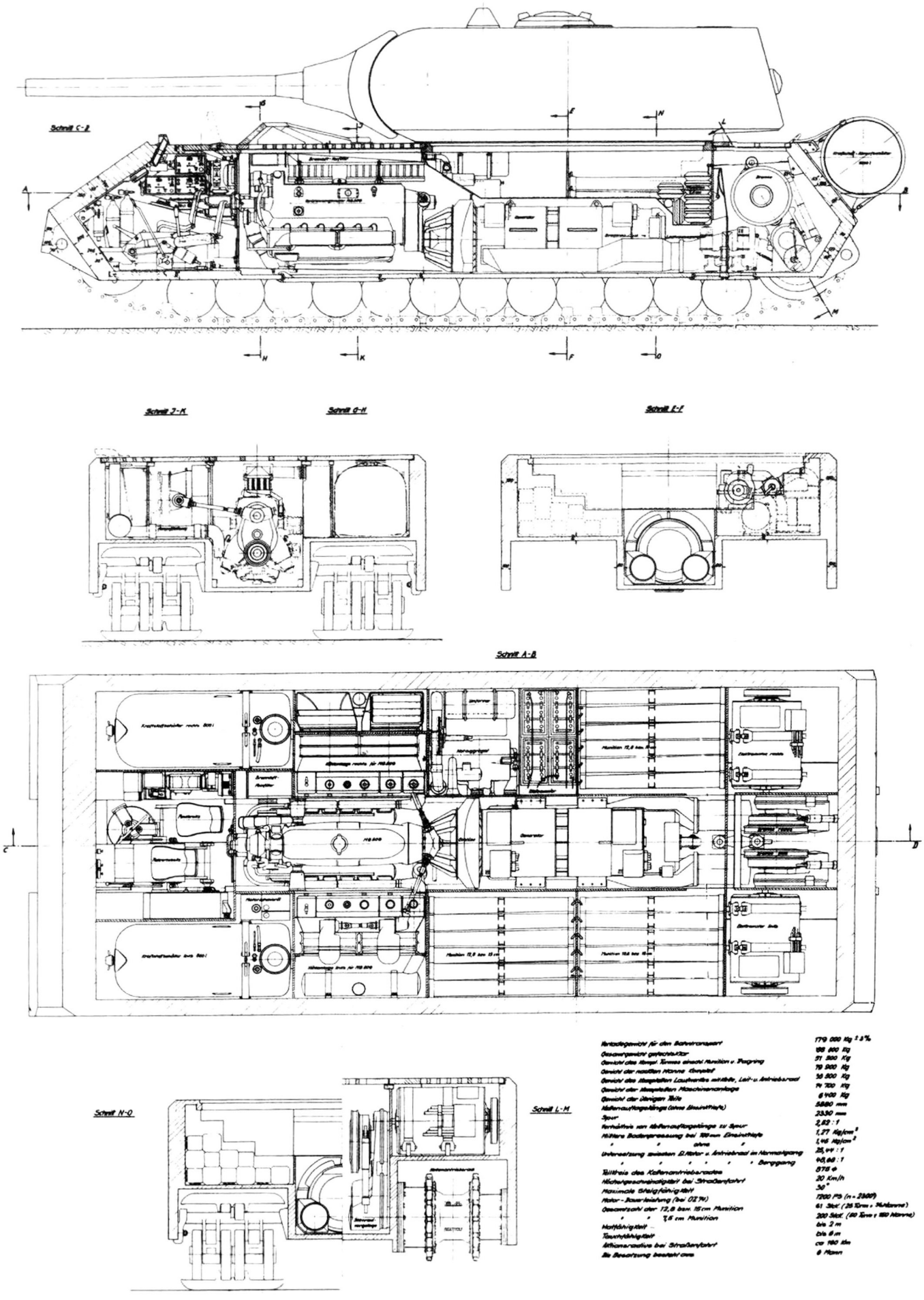
The 128 mm KwK 44 / 75 mm KwK 44 Maus in twin cradle is seen in Krupp's Berta-Werke in Breslau, ready for installation in the turret. The nonmachined parts of the gun barrels came from the Bochumer Verein AG and were hardened and tempered by Klöckner Osnabrück.



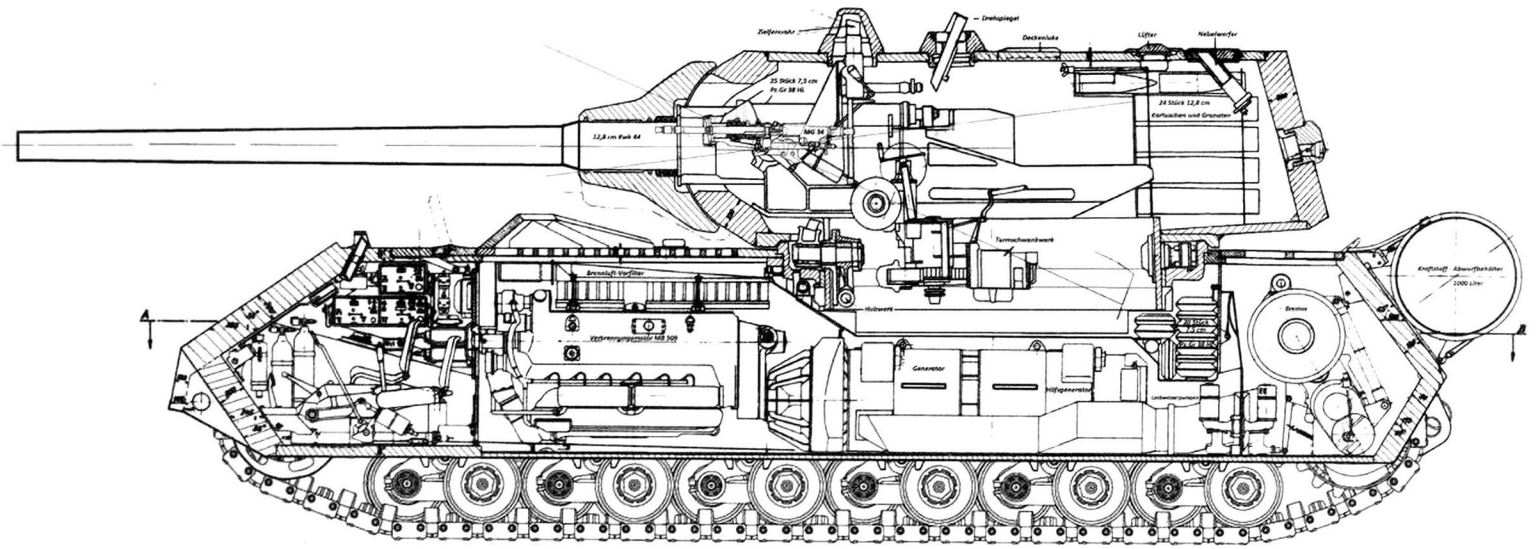
Mounting complete, the guns are on a test firing stand in Meppen. The difference in size between the 128 mm KwK 44 and the 75 mm KwK 44 is considerable. The 128 mm KwK weighed approximately 7 tons.

(S/60 impact fuse or 23/28 time delay or double fuse) and charge L/4.5 weighing 26 kg [57.3 lb.] or charge L/50 weighing 28 kg [61.7 lb.] with a muzzle velocity of 940 m/sec [3,084 ft/s]; and a flare round with a burn duration of 60 or 90 seconds. The cartridges (872 mm [34.3 in.] long, 192 mm [7.56 in.] tube rim diameter) were supposed to be equally usable for armor-piercing or high-explosive ammunition. The main types of ammunition to be used in combat were the Panzergranate 43 (armor-piercing) and the Sprenggranate L/4.5 or L/5 (high-explosive), with an equal number of each type carried

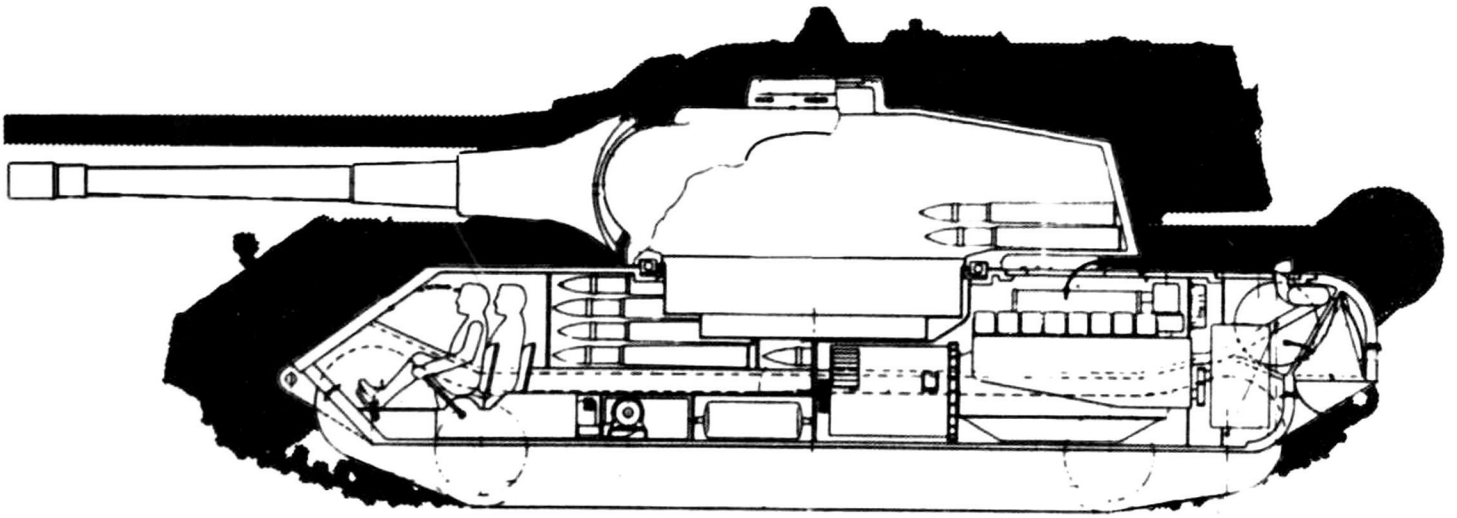
inside the tank. Rate of fire was to have been three to four rounds per minute. Using one-piece 88 mm ammunition, the Tiger I had a rate of fire of eight to nine shots per minute, while the Russian IS 2 heavy tank, with just one loader and two-part 122 mm ammunition for its D-25T main gun with the projectile weighing 25 kg [55 lb.] and the cartridge 14 kg [31 lb.] achieved a rate of fire of just two to three shots per minute. One-piece 128 mm ammunition would have enabled a rate of fire of four to five shots per minute, but the rounds, which were between 1,458 and 1,896 mm [57.4 and 76.65 in.] long, weighed up to 63.5 kg [140 lb.] (128 mm SprGr. L/3.8)—too much for the loader working in the cramped conditions of the turret. Loading aids would have to be added, for it had been discovered that in practice, 88 mm ammunition weighing about 23 kg [50.7 lb.] was the limit for fixed ammunition. The enormous length of the shells was also difficult to manage in the turret. Depending on the type of projectile, weight breakdown for the two-part ammunition was up to 28.3 kg [62.4 lb.] for the projectile (Panzergranate Type 43) and for the cartridge with propellant charge up to 26.6 kg [58.6 lb.] (also Panzergranate Type 43). The first firing trials were carried out in Meppen on November 3, 1943, using barrel number two. These included tests with the TS 12.8/10.5 cm discarding sabot round. It was found this projectile was unsuitable for fixed ammunition and was not safe for use with a muzzle brake. Four days later, a request for a loading arm similar to the 128 mm KwK 44 (Skoda) was received. It was supposed to ease loading of two-part ammunition. On November 16, 54 rounds of 128 mm Panzergranaten 43 and 35 rounds of 128 mm Panzergranaten L/3.8 ammunition were delivered to Krupp's firing range in Meppen. From November 16–18, 1943, the 128 mm V 121 (L/76) anti-tank gun mounted in the carriage of the 210 mm Mörser 18—later with an experimental L/62 barrel—was used to test the penetrative abilities of various types of 128 mm armor-piercing ammunition. On November 24, 1943, the 128mm KwK 44 (barrel no. 6) was fired on carriage number three. During the following two days durability and comparative temperature firing trials were carried out. The desired objective with the Panzergranate 43 was a muzzle velocity of 940 m/s [3,084 f/s] at a maximum pressure of 3,700 kg/cm² [52,626 lbs/in²]. Different guides and propellant charge quantities were tested. While the highest level of performance was desired, the life of the barrel had to be economically justifiable, as austerity measures were beginning to affect powder quantities. On November 10, 1943, the Maus' basic ammunition load was established at 500 rounds of L/4.5 high-explosive and 500 rounds of Type 43 (with cap) armor-piercing. Testing of penetrative ability and the different guides, as well as the propellant charge definition at Meppen, were carried out on December 21–22, 1943. Panzergranate 43 charge firing took place May 16–18, 1944, followed by charge firing of the L/5 high-explosive round on May 19. At a meeting in Düneberg on May 23, 1944, the results were evaluated by WaPrüf 1 (Ballistics and Munitions Department) and a decision was made on a standard cartridge. On June 13, 1944, WaPrüf 1 decided to reduce the Vo of the 128 mm armor-piercing round to 905/925 m/s [2,952/3,035 ft/s]. The advantage was maintaining powder pressure from then on at 3,600 kg/cm² [51,204 lbs/in²]—saving powder—and use of the standard cartridge for the 28 kg [61.7 lb.] L/5 high-explosive round and a Vo of 920/940 m/s [3,018–3,084 ft/s]. In addition to the 128 mm KwK 44 and Pjk 44, this cartridge could also be used in the 128 mm Kanone 44. This was an advantage for production and logistics. The armament was supplemented by the 360-degree rotatable "close defense weapon" mounted atop the turret as installed in other German heavy tanks. In principle, this weapon was a small mortar that fired *Schnellnebelkerzen* 39 smoke candles, grenades, Orange 160 smoke signals, and *Leuchtgeschosse* R flares. Range was seven to ten meters [22.9–32.8 ft.]. The flare pistol could also be used to fire the *Sprenggranatpatrone* 326 Lp (high-explosive shell) through the opening for close defense. Starting with prototype turret number two, this weapon was to change places with the second roof ventilator, which on prototype turret one was still mounted in front of it. This made it easier to operate, because the two 128 mm ammunition containers at the back of the turret on the left and right spared little room. Behind these ammunition containers in the rear of the turret there was room for accessories and the crew's personal baggage. Equipment included an MP 40 submachine gun, a *Sturmgewehr* 44 assault rifle, and a flare pistol. There were two ball mounts in the left and right sides of the turret in which the MP 40 could be fixed to defend the vehicle against tank killers. The ammunition hatch in the rear part of the turret could also be used for close defense. The revolving turret platform had hatches for access to the ammunition in the hull, the 48-Volt auxiliary power unit, the turret electrical system's slip ring body, and the double generator. Thought was also given to the possibility of abandoning the tank in an emergency. While driving under water, the turret crew was fed oxygen via the open generator flap, as the air pipe was mounted on the driver's opening.



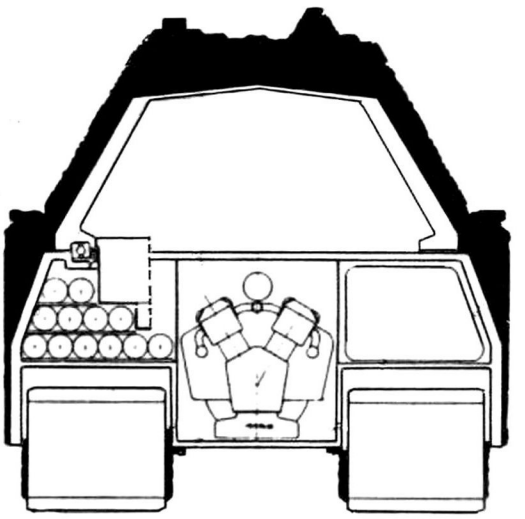
Maus plan as of June 1943. The turret still has the old-style commander's hatch on the right side and also differs from the ultimate plan in its distribution of ammunition and specifications.



The ultimate Maus 205/2 plan in cross section. For the first time it has the turret equipment as of July–October 1944, but with the inverted MB 509 gasoline engine.



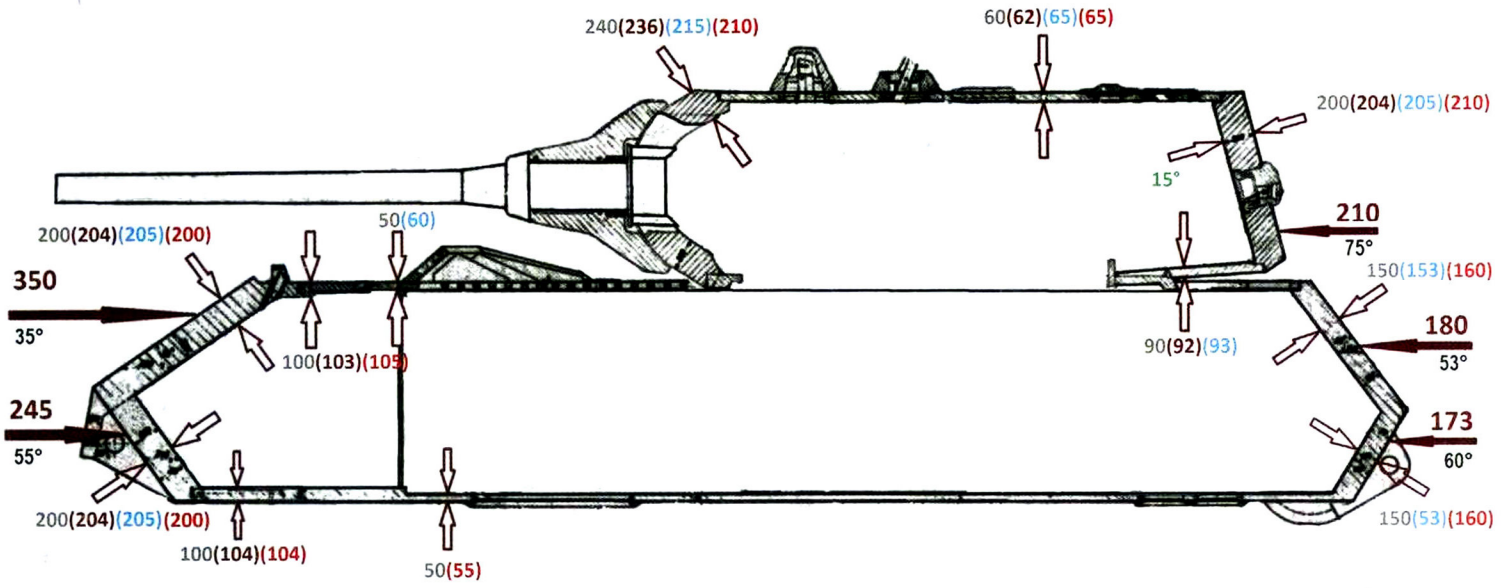
From Mäuschen (Little Mouse) to the Maus (Mouse): constant requests for changes in armor and armament resulted in the Maus project's weight rising from about 120 tons to about 190 tons in one and a half years.



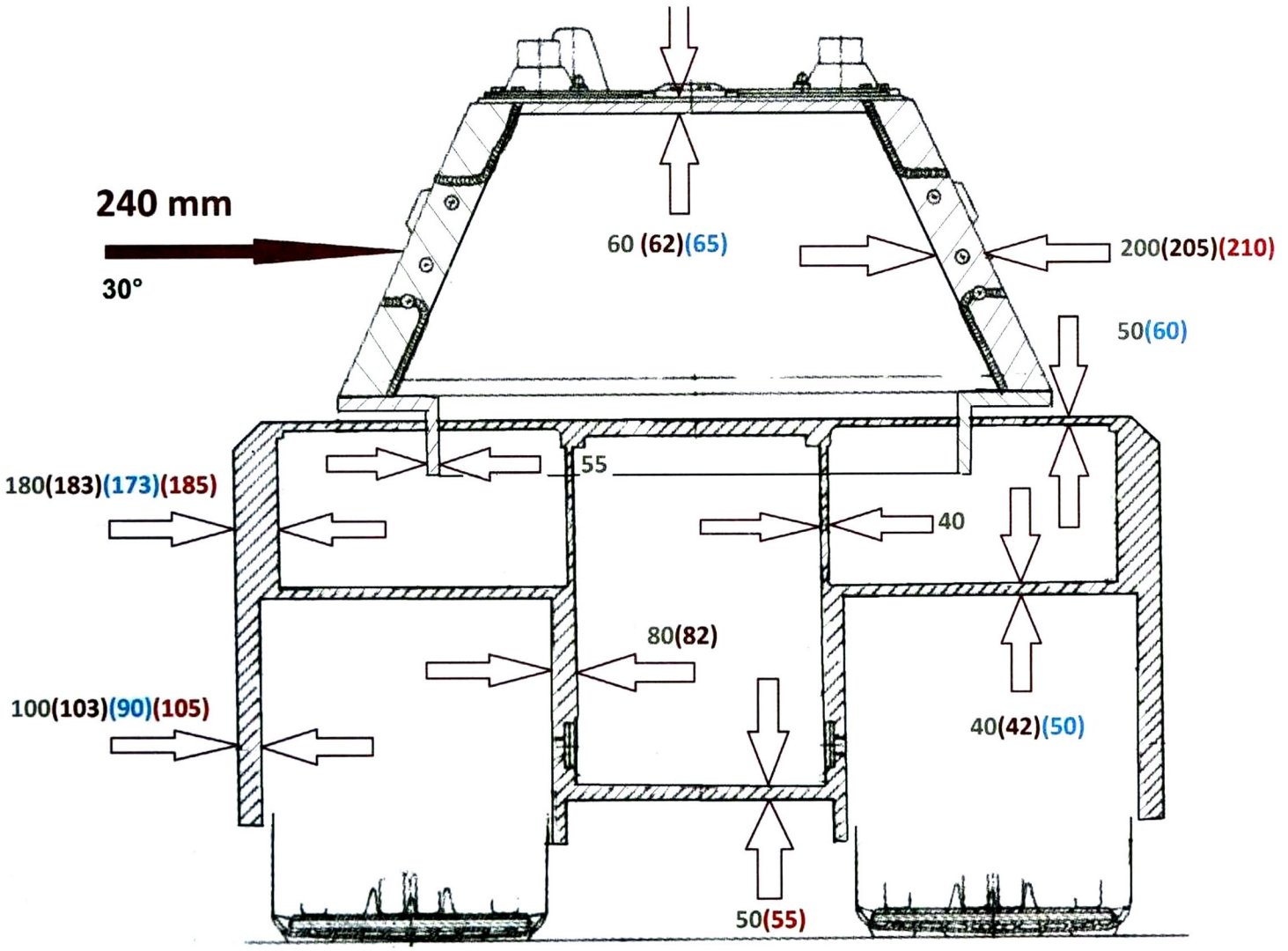
Production of the Mice

Construction under Adverse Conditions

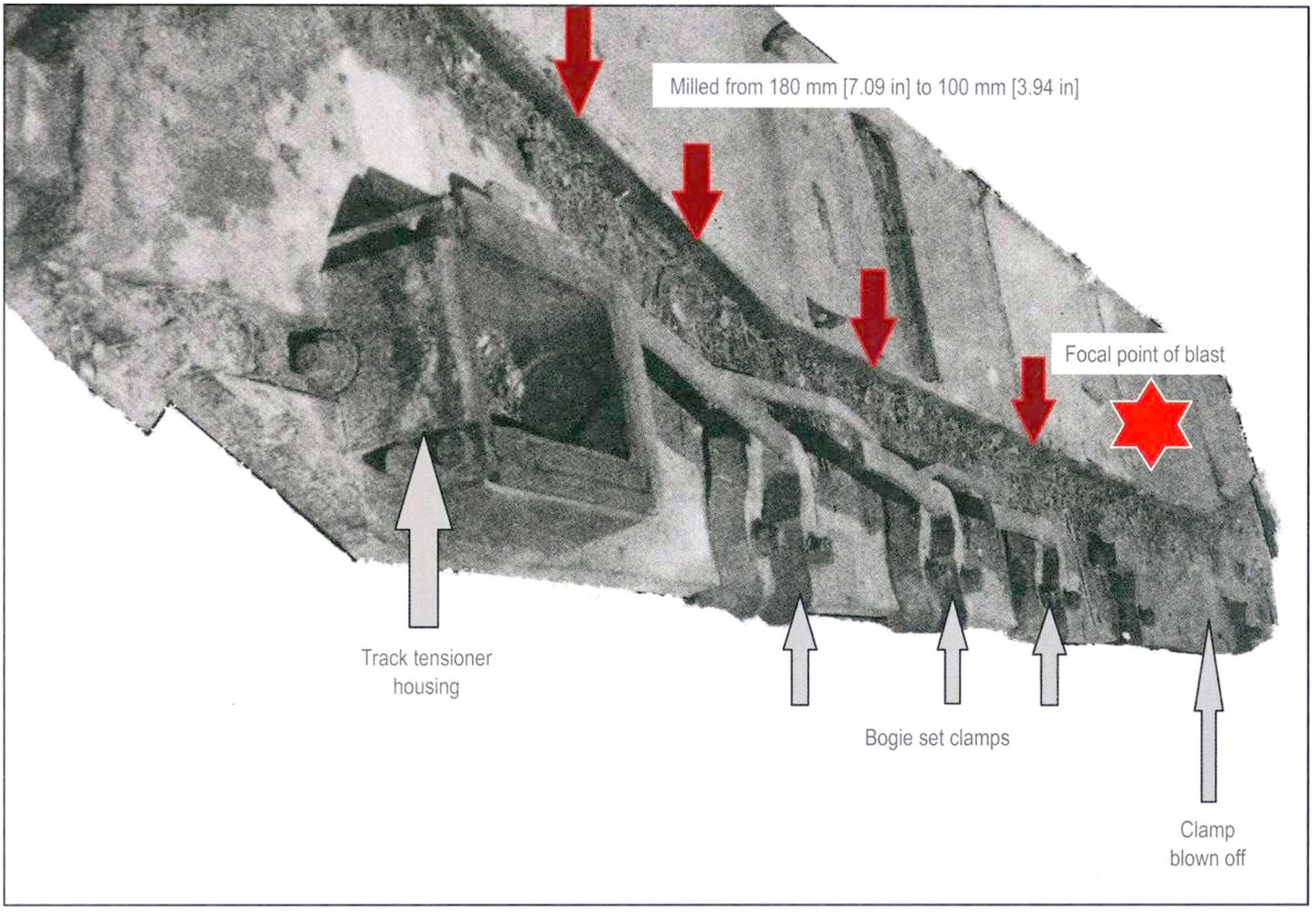
Development had now progressed to the point that production of the six prototype chassis and six prototype turrets could begin. Production was plagued by serious problems. In addition to various material shortages, from March 1943, the situation was exacerbated by the Allied strategic bombing campaign. The wooden turret models had already been destroyed by fire at Krupp's facility in Essen, and further problems arose after the bombing of the Kugelfischer factories in Schweinfurt in August 1943. The resulting drop in ball and roller bearing production set back production of the Maus. The raid on the Krupp factories in Essen on July 25, 1943, halted work for more than half a year, which was the main reason why production of the Maus was finally canceled in October 1943. Unusual cracks in the weld beads were most commonly encountered when standard armor electrodes were used during manufacture. Good results could only be achieved with more highly alloyed electrodes, but these contained materials that were in short supply, like chrome, nickel, and molybdenum. Two thousand kilograms [4,409 lb.] of welding electrodes were used to make one hull, one-third being highly alloyed NCT 3 and V4A electrodes. The greatest technical difficulty was presented by the armored side plates with integral track guards; they were supposed to be made from one plate. Incidentally, because of the persistent shortage of raw materials in the German Reich, armor plating was then being taken from the Kriegsmarine's reserve, as by that time the navy's surface fleet had become irrelevant. These basic plates were 2,000 × 2,300 mm [78.74 × 90.55 in.] in size and 200 mm [7.87 in.] thick; other plates had dimensions of 1,600 mm × 1,000 mm × 200 mm [62.99 × 39.37 × 7.87 in.]. The material types used by the navy were partially cemented armor plate made using the Krupp process (KC) and the "Wotan hard new type" (WhnA) or "Wotan soft new type" (WwnA) armor plates. These navy plates were characterized by their low carbon content, but nickel content was higher with less strength. Nowadays, the steel would be classified as low-alloy chromium-nickel structural steel. This term is not rooted in a lack of quality, but is a designation for steels with low carbon content (less than 0.42%). These Wotan plates were used where armor thickness was the greatest, as in the front and side armor of the hull and turret. The remaining armor plates were made of the usual armor steel (PP 8182, PP 8350, or FMC 35G). (The chemical composition and the physical characteristics of the common German steels are listed in the chapter "Technology in Detail," p. 155). There was considerable deviation in measurements of plate thicknesses. Later measurements by the Allies also differed sharply, which is in part explained by continuing changes in production. The brown arrows in the following drawings show the penetration path of a horizontal projectile through sloped armor. The advantage of sloped armor could not be exploited for the side armor. The differences were amazing. Comparison to later Soviet analyses was also interesting. The side armor plate was 180 mm [7.09 in.] thick and was supposed to taper to 100 mm [3.94 in.] in the area of the running gear. Two different ways of achieving this were discussed. The first variant was milling of this large area. This was very labor and material intensive, with material loss reaching as high as 4.5 tons of high-grade steel. Also the milled steel curled and had to be straightened, which was an expensive process. In Germany, Krupp was the only company with machine tools big enough to carry out this milling work. Quantity production would come to a standstill if the necessary machine tools were lost. The second variant consisted of welding together a 100 mm [3.94 in.] plate and an 80 mm [3.15 in.] plate. The outer surfaces were too uneven and the process would have created an air space that would have to be sealed with cementite (iron carbide). This also would have exceeded the very tight loading dimensions. Professor Porsche had learned that the Kriegsmarine had previously undertaken firing trials and found that the penetration resistance of double plates was only about 70% of a homogenous plate of the same thickness. The production cost was also higher with two plates, consequently, the first variant was favored. The material wastage had to be accepted. For the later series, it was planned to reduce the side plates to 170 mm [6.69 in.] beginning with hull number 4, with the track skirts just 70 mm [2.76 in.] thick. From hull number 7, the thickness of the front and side armor, the front track guards, and the front deck were to be reduced by 5 mm [0.2 in.]. English measurements of hulls in storage at Krupp in May 1945 revealed the side armor had been reduced to 170/90 mm [6.69/3.54 in.] and the rear armor to 150 mm [5.9 in.] at an earlier time, beginning with hull number 3. It is therefore not surprising the armor measurements made by the Soviets on Maus 205/1 differ from those of the later hulls and turrets discovered at Krupp.



Path of shot penetration through armor.



Planned armor thicknesses
Actual measured thicknesses before firing tests
English secret service values
Soviet measurements



The blown-off side plate from April 20, 1945.

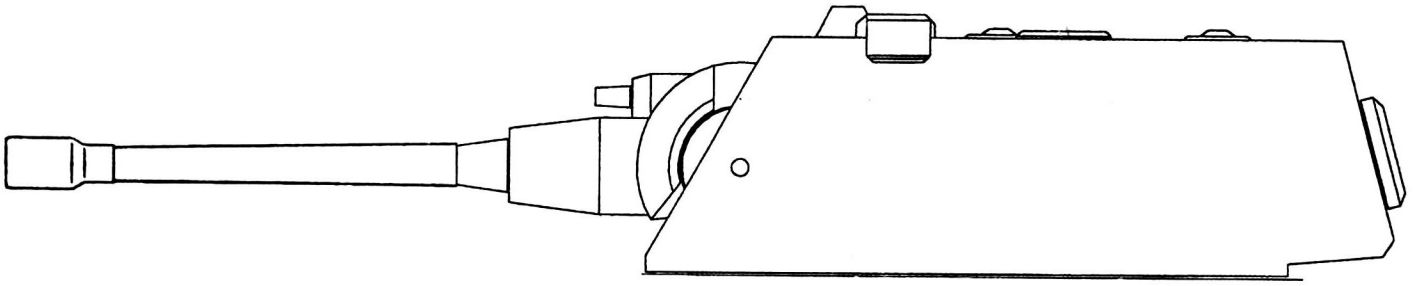
Waprüf 6 and Krupp had concluded a contract for production of a prototype turret on December 19, 1942, even though no decision had been made about the tank to be built. On January 15, 1943, the contract was signed for the building of a prototype 205 Maus hull. Krupp initiated production three days later. Another contract for the production of six pre-production hulls was concluded on February 20, 1943. The plan was to produce ten tanks per month, with a total production run of 120. A contract for 120 examples of the 128 mm KwK 44 L/55 was signed on March 4, 1943. Essen was heavily bombed the night of March 5–6 and the Krupp works were badly damaged. All of the drawings and computations for the turret and armament were lost in the flames and had to be redone. Production of the first five turrets was delayed two months. The prototype turret was now to be completed by November 1, 1943, three zero series turrets in December, and three more in January. Ten production turrets were also to be completed each month. On May 5, 1943, the production run was increased from 120 to 135 vehicles. Together with the six pre-production tanks, this brought the total number of Porsche 205 tanks to be built to 141. In June 1943, *Generaloberst* Guderian declared he first wanted just five Mäuse so their practicability could be tested. On July 1, 1943, the tank commission decided to reduce monthly production from ten vehicles to five. Everything else remained as before. The shell of the first hull was completed on July 7, 1943, and armor plates were cut for another nine hulls. On July 12, WaPrüf 6 informed Krupp the first six prototype vehicles would receive numbers 351 451 to 351 456, and the production vehicles numbers 351 457 to 351 591. On July 25, Essen was hit by another bombing raid, this time seriously affecting hull production at Krupp. Krupp reported to the Army Ordnance Office that no further work on hull number 1 was possible in the immediate future. Alkett, in Berlin, was asked if it could take over work on the hull. Hull numbers 2, 3, and 4 were in the vehicle workshop, and hull number 2 could be completed in three days. Installation of the armor on hulls 5, 6, and 7 could be completed. The armor plates had been cut for hulls 8 and 9. The armor plates had been delivered for ten hulls and the plates had been rolled for twenty. These components would only be accessible after the rubble had been cleared away. As for the turrets, the armor plates for turret number 1 were finished, but completion was set back until December 1, 1943. Parts of turrets 2, 3, and 4 were in the vehicle

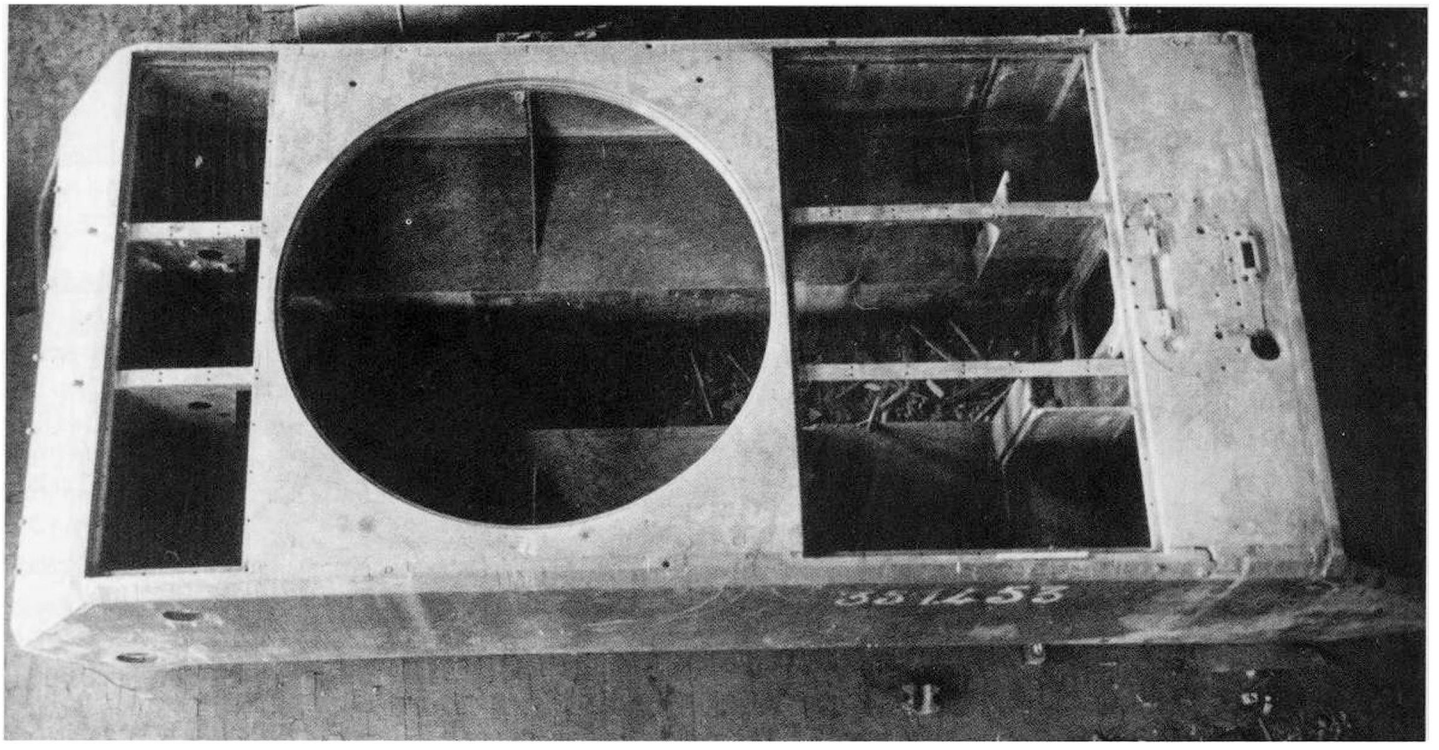
workshop, and armor plates for turrets 5 to 9 were being cut. On August 18, 1943, Krupp informed the Army Ordnance Office seven months were needed to repair the damage and resume production of the hulls—eight for turret production. On August 3, 1943 (date and stamp date were changed by hand to September 3, 1943!), the contract quantity was reduced from 135 to 58 production Type 205 Maus tanks. Monthly deliveries were set at three in February 1944, and five per month beginning in March. On August 25, 1943, the Army Ordnance Office advised Krupp it was only to complete thirty hulls and turrets pending testing. On September 26, 1943, hull 205/1 was moved from Krupp-Essen to Alkett's Factory III in Berlin with the help of an R 80 Culemeyer vehicle (heavy loader) for completion of assembly.

Cancellation of Series Production

On October 27, 1943, Krupp received a telegram from the special commission for tank production advising Karl-Otto Saur, head of the department for armaments and war production, had decided to complete just one Maus. All labor forces, machine tools, and equipment from the Maus production program were to be used for the production of other tanks and the remaining armor plates for the so-called "assault gun program." On November 4, 1943, the tank officer attached to the army chief of staff ordered an end to development of the Maus. Just a single Maus tank was to be completed. On November 5, the Army Ordnance Office's WaRüst canceled the contract for series production of the Maus turret and hull. Then, on November 12, the contract for six pre-production turrets was reduced to one and the six Maus prototypes to two chassis. At the repeated request of Krupp the number was increased to three hulls and three turrets, as hull 3 and turrets 2 and 3 were almost complete. On November 17, 1943, it was decided to stop the contract for six hulls and six turrets for prototype chassis, except for three hulls and three turrets. Production state: hull 3 almost complete; hull 4 mechanically complete, except for various drilling work; and hulls 5 and 6 completely welded but no mechanical work done. Also canceled was the contract for 58 production hulls and turrets. The contract for eight 128 mm guns continued, as did the one for 58 guns, as well as for nine barrels complete with breech and breech ring, fifteen barrels without breech and breech ring, and twelve breech wedges. Halted were only the 58 sets of accessory and stocked parts and the 58 double cradles that could not be used for the Pjk 44. All hope of Maus production had not been abandoned at that time, as indicated in the exchange of letters between Krupp's AKP (Artillery Design, [Panzer] Design/Light Artillery Subdivision) and the Army Ordnance Office of March 18, April 1, and April 11, 1944. They related the state of the parts on hand that had not yet been scrapped and the prerequisites for the production of one to two vehicles per month. It was found that thirty sets of armor material had already been rolled and that enough for fifteen hulls and nine turrets had been cut and processed. Commercially available parts had been used elsewhere and from turret 7 had to be procured anew. The correspondence particularly stressed the difficulty in procuring roller bearings. The resumption of production would also require an especially high priority level. For production of two Maus tanks per month, either the Tiger and 170 mm cannon production would have to be reduced or approximately 127 additional workers would have to be provided to the various departments, like Panzerbau 1 and Panzerbau 2 (tank construction), the vehicle workshop, and the second mechanical workshop. Deliveries from Maus number 8 could only begin after about seven months at the earliest. Only the completion of hulls 3 to 7 and turrets 2 to 7 would have been possible earlier because most of the materials were on hand and the shells had been welded. Later, on July 8, 1944, WaPrüf 4 informed Krupp there was no more interest in the two complete guns and five gun barrels for the 150 mm KwK L/38 and the contract had been canceled. This referred to further development of the Maus II turret with the 75 mm tank gun on top. The guns were mounted one atop the other as on the Neubaufahrzeug by Rheinmetall. The front armor plates could be mounted as simple sloped plates, which would have saved working hours, material, and weight. The turret was shorter and had a horizontal range finder with a 1.2 meter [3.94 in.] base. The armor was to be like that of the E-100 turret—200 mm [7.87 in.] in front, 150 mm [5.91 in.] in the rear, 80 mm [3.15 in.] on the sides, and 40 mm [1.57 in.] in the roof. This caused the turret's weight to fall from 55 to 35 tons. On June 27, 1944, the Army Ordnance Office confirmed the scrapping of the 40 tons of cast steel parts and the wooden model in the Gruson factory in Magdeburg, and on July 30, 1944, the scrapping of the four hulls at Krupp. On July 18, Krupp issued the bill for six hull shells totaling 1,080,000 Reichsmarks (although only three were complete), as well as for six turrets without weapons for 990,000 Reichsmarks. The hull unit price was 180,000 RM, while that of a turret was 165,000 RM. The turret used on the range cost a similar amount. There was no mention of the two range hulls or the seventh Maus. Meanwhile, at Alkett assembly work on hull 205/1 continued. During this, it was found the design width had been exceeded by 17 mm [0.67 in.] (the side armor + 11 mm [0.433 in.] on

the left and + 6 mm [0.24 in.] on the right). Thus, the Reichsbahn's demand for a maximum tolerance of 15 mm [0.59 in.] was met precisely. Alkett completed work on the first prototype hull (number 351 451) on December 22, 1943.





Completed hull shell number 3 (351 453) in the vehicle workshop, which was relocated to Krupp's facility in Essen (photo taken after the war).

Maus 205/1 – The Turretless One

Initial Tests

By December 22, 1943, the Alkett company had completed the assembly of Maus 205/1 to such an extent that the first test drives could be carried out. As production of turrets by Krupp had not yet resumed, a 55 ton turret mock-up—probably made entirely of cast iron (and not filled with concrete, as was usually the case)—was used to simulate the weight of the turret. This was centered with segments between the mock-up's turret supporting ring and the turret cutout in the hull, connected by a crossbeam. All of the participants were curious to see if Professor Porsche's claim the Maus could turn on the spot would be proven right. OR Kniekamp of WaPrüf 6 and the experts from the technical university doubted it. They had calculated turning would not be possible because of the high contact pressures. The problem was there was an order from Albert Speer that said the tank could not be moved without the authorization of the Minister for Armaments and Munitions (Speer) or his ministry, but the curiosity was just too great. Alkett did not want to see itself and Professor Porsche blamed before the officers of the armaments ministry and the Army Ordnance Office should the test fail, so workshop director Seitz and Walter Schmidt—the responsible engineers from Porsche—decided to carry out a test drive of the Maus on plant grounds on Friday, December 24, 1943. (In his book Ferry Porsche wrote December 23 was a Friday, as did Walter J. Spielberger, but in a letter Ghislaine Kaes wrote of an afternoon off—and that can only have been Christmas Eve, December 24, 1943, and that really was a Friday. At that time there were very few days off.) Engineer Walter Schmidt succeeded in talking the guards into a test drive in the Maus. Porsche's factory driver Karl Gensberger, an experienced technician who had previously test driven the Ferdinand tank destroyer, started the tank. He then had to squeeze the Maus between the wall of a house and a fence. In places there were just 1¼ inches to spare, but from the very start in the factory hall and on the plant grounds the tank demonstrated it could be steered and driven with great precision. The drive proceeded through Alkett's cramped factory grounds in the direction of the test site on the former Ruhleben trotting race course, where newly built tanks and assault guns were tested during the war. When the Maus reached the test site a turn was made, and despite the soft ground it was completed without problems. The tank's turning circle was just eight meters [26.24 in.]. Afterward it headed back to the factory hall. The impossible had been accomplished. The Maus drove

Maus test drive on Alkett's factory grounds.

The stands of the Ruhleben racetrack (background).

On the racetrack.

Turn and back.

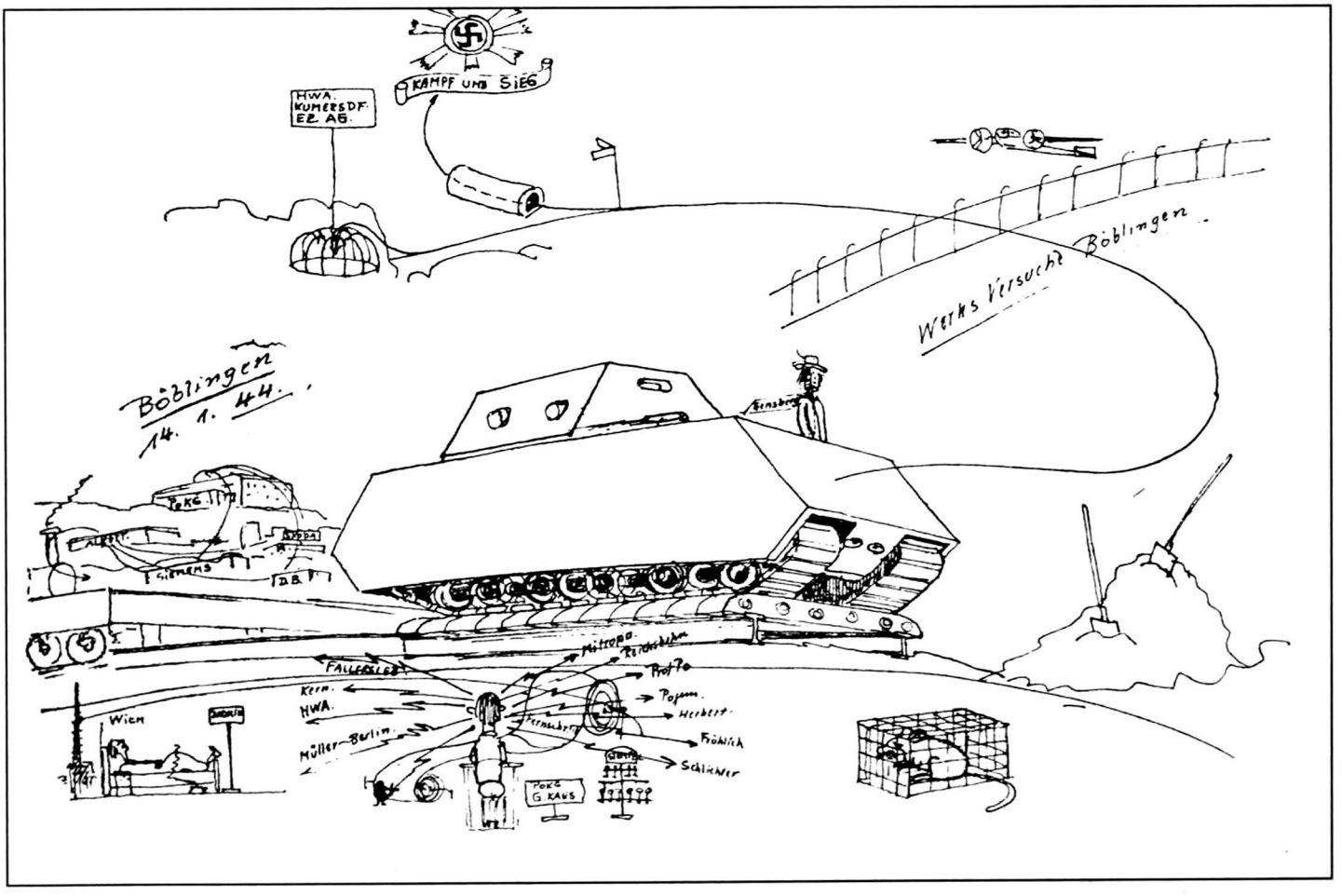
Clearly visible is the massive casting of the weight simulator (turret).

precisely and was very easy to handle. Engineer Walter Schmidt was so enthused and impressed that he immediately wired the good news to Professor Porsche. Porsche was very pleased, but at the same time he was less than happy that the Maus had not turned on the spot. He immediately called electrics expert Otto Zadnik, who was sick in bed with the flu in Vienna. Despite his illness, on Christmas Day he checked the circuitry and fixed the error. Now the Maus was capable of turning in place as the professor had calculated.

Transport to Böblingen

As per the agreement with WaPrüf 6 of November 1, 1943, the first factory trials were to be carried out after completion by Porsche at the Alkett factory. Karl R. Pawlas' statement that Maus 205/1 first went to Kummersdorf-Gut is not correct (*Weapons Review* No. 19). Waldemar Trojca noted that the bombing raids on Berlin were the reason why the testing was carried out in Böblingen (*German Panzer Secret Projects*). Not so, as the area around Stuttgart was also frequently bombed; on the other hand, according to Wolfgang Fleischer, Kummersdorf-Gut was never seriously bombed (*Experimental Station Kummersdorf*). Professor Porsche simply wanted the Maus to be near Stuttgart. Panzer Replacement Battalion 7 (*Panzerersatzabteilung* 7) was stationed at Böblingen and had a large workshop and an extensive training area. Its commanding officer was enthusiastic and eager to assist the test program with the means at his disposal. The choice of railway line was a problem. Reichsbahn headquarters demanded the train transporting the Maus not cross any bridges and only pass through freight yards. Because of the train's excessive width, oncoming trains would have to be stopped or rerouted. Despite the difficulties, a route was found from Berlin to Böblingen. On January 11, 1944, Maus 205/1 entrained under its own power on railway siding 119 of Alkett's Factory III. The tongue-in-cheek drawing by chief engineer Karl Rabe on January 14 illuminates the entire theme of Maus testing: at the controls during detraining in Böblingen is Karl Gensberger. In the center, where Porsche secretary Ghislaine Kaes is, all data comes together, whether from Willy Müller, Porsche K.G.'s government representative in Berlin, from the Army Ordnance Office in Berlin, from the

On January 14, 1944, the Maus arrived without incident at Böblingen air base's railway siding.



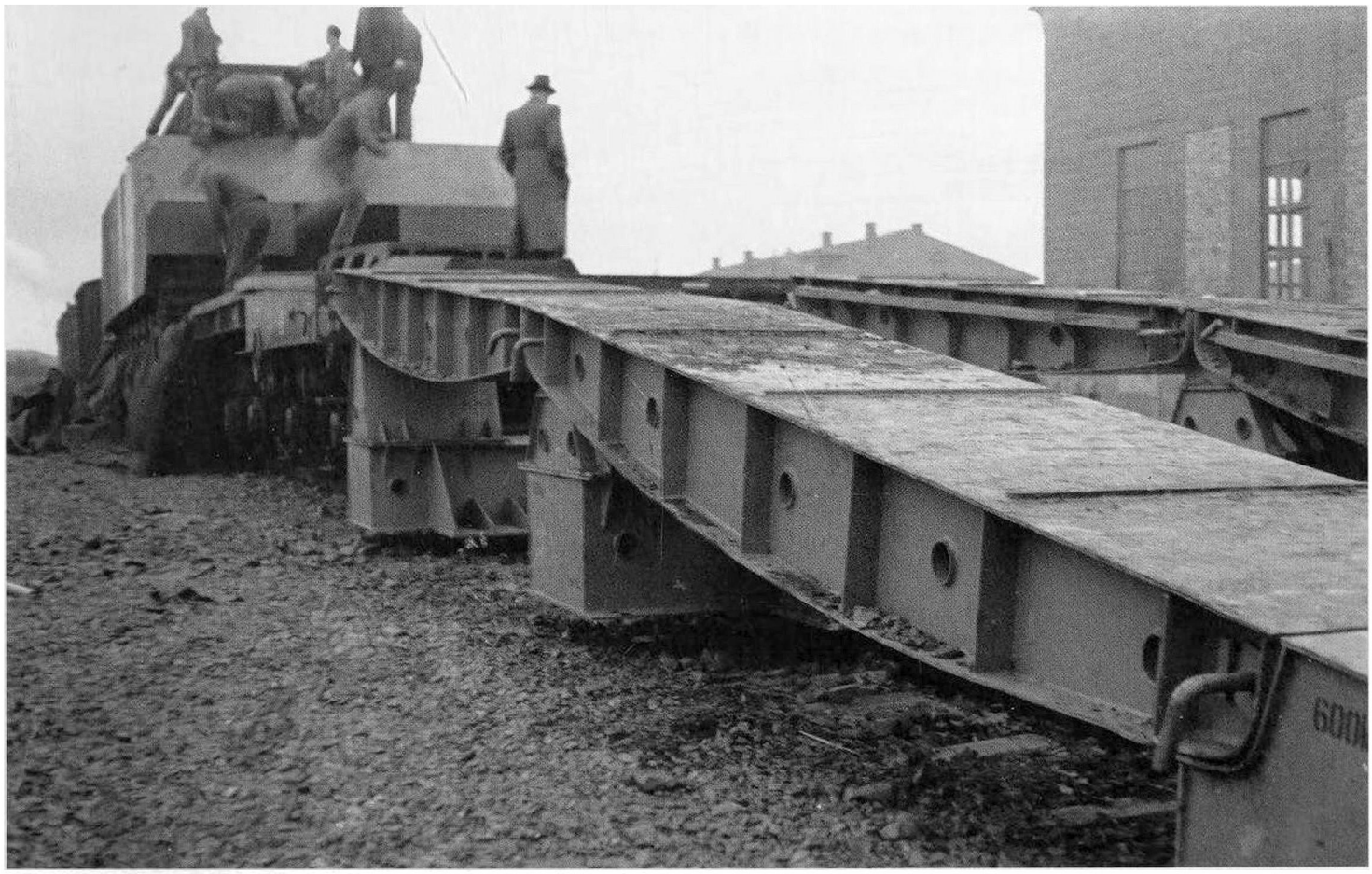
Drawing by chief engineer Karl Rabe depicting testing of the Maus.

Soldiers place four supports to take the load off the forward bogie. Perforated rails that accompanied the tank were used for this. The canvas covers were removed and the accompanying engineers collected their bags.

A special loading ramp brought with the tank is moved into place for unloading at Böblingen air base.

While the new Skoda plate tracks have been unloaded, the 1,000 liter [264 gal] external fuel tank is still on the hook.

Final consultations and the engine of Maus 205/1 is started.



Precise driving is especially important when loading and unloading tanks during rail transport. No problem for driver Gensberger with the Maus. However, when the tank started down, the loose parts of the ramp shifted and they were badly damaged. Present were Professor Porsche, Ferry Porsche, Erwin Komeda, Walter Schmidt, Otto Zadnik, Wilhelm Ringle, and drivers Karl Gensberger and Heinz Gröschel.

Maus 205/1 drives carefully down the damaged loading ramp under its own power. Four supports were placed under the affected bogie because of the danger of axle breakage.

Arrival in the factory hall in Böblingen, also called the "Porsche workshop."

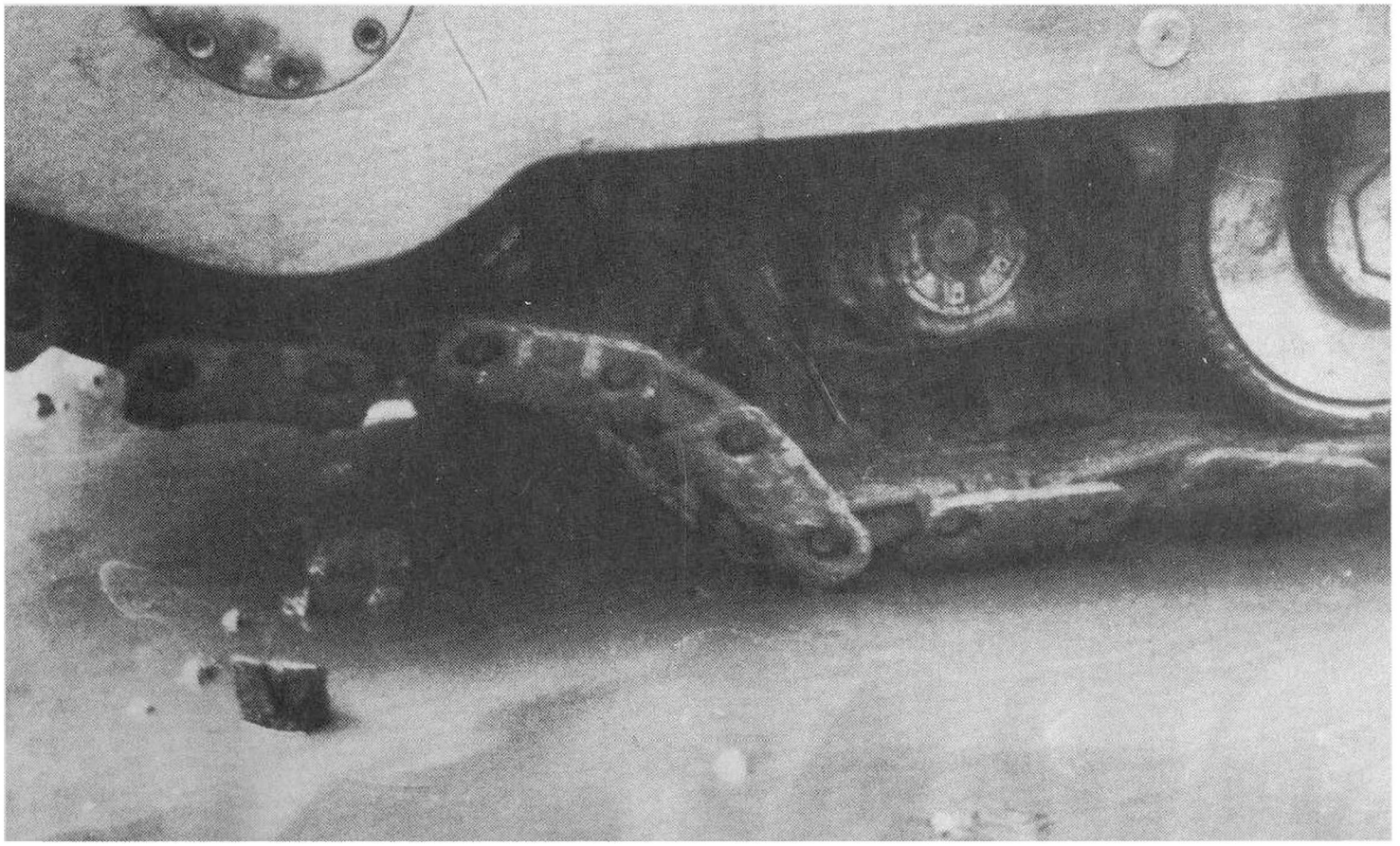
Reichsbahn, which was to supply the heavy rail car, or from Mitropa, where the sleeping car spaces were reserved. Connections with Professor Ferdinand Porsche and Porsche junior, with chief drive engineer Karl Fröhlich, with the engineer in charge of drive testing Eugen Schlichter, with the liaison engineer to the Army Ordnance Office Herbert Kaes, with Porsche's commercial manager K.G. Kern, and the VW laboratory in Fallersleben come together there. Meanwhile, Otto Zadnik, the leading electrical engineer, is sick in bed in Vienna. The mouse arrives in Böblingen for factory trials in a cage, after which it is to go to the Army Ordnance Office in Kummersdorf in the next cage or straight into the struggle for victory. Meanwhile, Allied aircraft are over Böblingen. In the background are the component manufacturers: Daimler-Benz for the engine, Skoda for the running gear and drive, Siemens for the electrical system, and Alkett for assembly of the hull, all with Porsche K.G. interconnected.

To maintain secrecy, Maus 205/1 did not begin its five kilometer [3.1 mile] drive from Böblingen air base through the city of Böblingen to Panzerersatzabteilung 7's factory hall in the Hindenburg barracks on the east side of the city until 23:30. The factory test report states the drive was made without incident, but in the Porsche biography by Peter Müller one reads:

> When it [205/1] rolled from the freight rail station through the city at night in great secrecy, there was a snapping sound beneath the paving stones. At first the driver could not explain this metallic sound, which went through his bones. Then, the next day, he was presented with a bill by the city administration: the water pipes had been broken. They had been unable to withstand the tremendous pressure.

Information about the rest of the drive is known from the four surviving factory test reports. Copies of these were sent to the tank committee, to the OKH WaPrüf 6, to Maj. Hoffmann of Vers.Kraft. Kummersdorf, and to Porsche K.G. The first report, covering from January 11 to March 3, 1944, documents the transfer of the vehicle from Berlin to Böblingen on a fourteen-axle special Reichsbahn transport wagon from January 11–14, 1944, and alleges the only work carried out by Alkett Berlin's Spandau factory was that which could be undertaken under its own power. January 14 again describes the detraining. Driving and steering tests on the testing grounds, which the vehicle had to cover approximately two km [1.24 miles] to reach, began on January 15, 1944. As at Alkett, it was again found that the vehicle could be steered with great precision. Steerability was maintained even on loamy ground and a sinking depth in excess of 50 cm [19.69 in.]. The hydraulic on-road gear selection did not function as desired, and the tank was driven in low (off-road) gear. The tracks had also loosened and had to be re-tensioned. When driving in reverse, the tracks tended to form a so-called "track sack" (see photo).

Refueling in the Hindenburg Barracks before the first drive into the training area. With a fuel consumption of 3,800 liters [1,004 gal] of gasoline per 100 km [62 miles] off road, this was of critical importance.



When the tank was driven in reverse the track tended to form a "track sack."

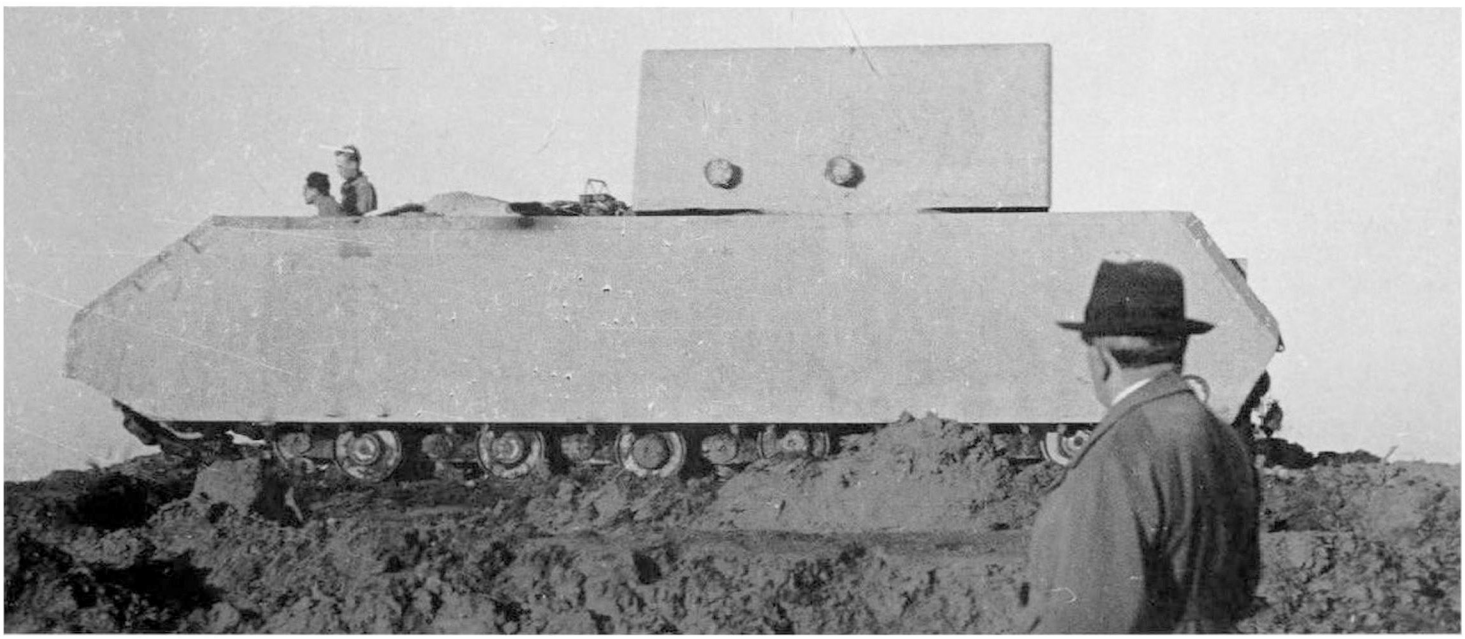
The ground after a 360 degree turn with the track braked.

From left to right: Otto Zadnik, Ferry Porsche, Karl Genbsberger, and Heinz Gröschel.

Installation Work and Further Testing

The period January 16–30, 1944, was characterized by various installation tasks. Adjustment tasks were carried out on the driving switch, the stop switch and driver's foot pedals, and the tachometer and other instruments (amp meter, voltmeter, etc.). Track adjustment proved too difficult, as the threaded spindle broke and had to undergo temporary repairs. There was a leak in the engine's exhaust cooling. The engine was removed for repairs and the line was welded. In the low voltage system there was minor damage to the left side alternator. The torsion shaft was broken and the control unit was defective; both were sent to Bosch. The Bowden cable to the main battery switch had to be strengthened. An electric motor driving the water pump in the engine compartment had a short circuit due to an installation error. In the high voltage system, the left side electric motor's carbon brushes were badly damaged because of a non-round collector. Driving tests were resumed on January 31, 1944. Successful steering tests were carried out on level and sloping ground, but also the crossing of ditches. Sometimes one track side had ground contact of just one to two meters [3.28–6.56 ft.] (see photo). The results of the test: once again, a torsion shaft in one alternator was broken, resulting in no battery charging. The batteries were exhausted after three hours of driving. The result was decreased energizing current and increased armature current and generator temperatures rose. With respect to the running gear, as expected, settling of the road

Captured tanks like this KV 1 were also tested at the proving center.



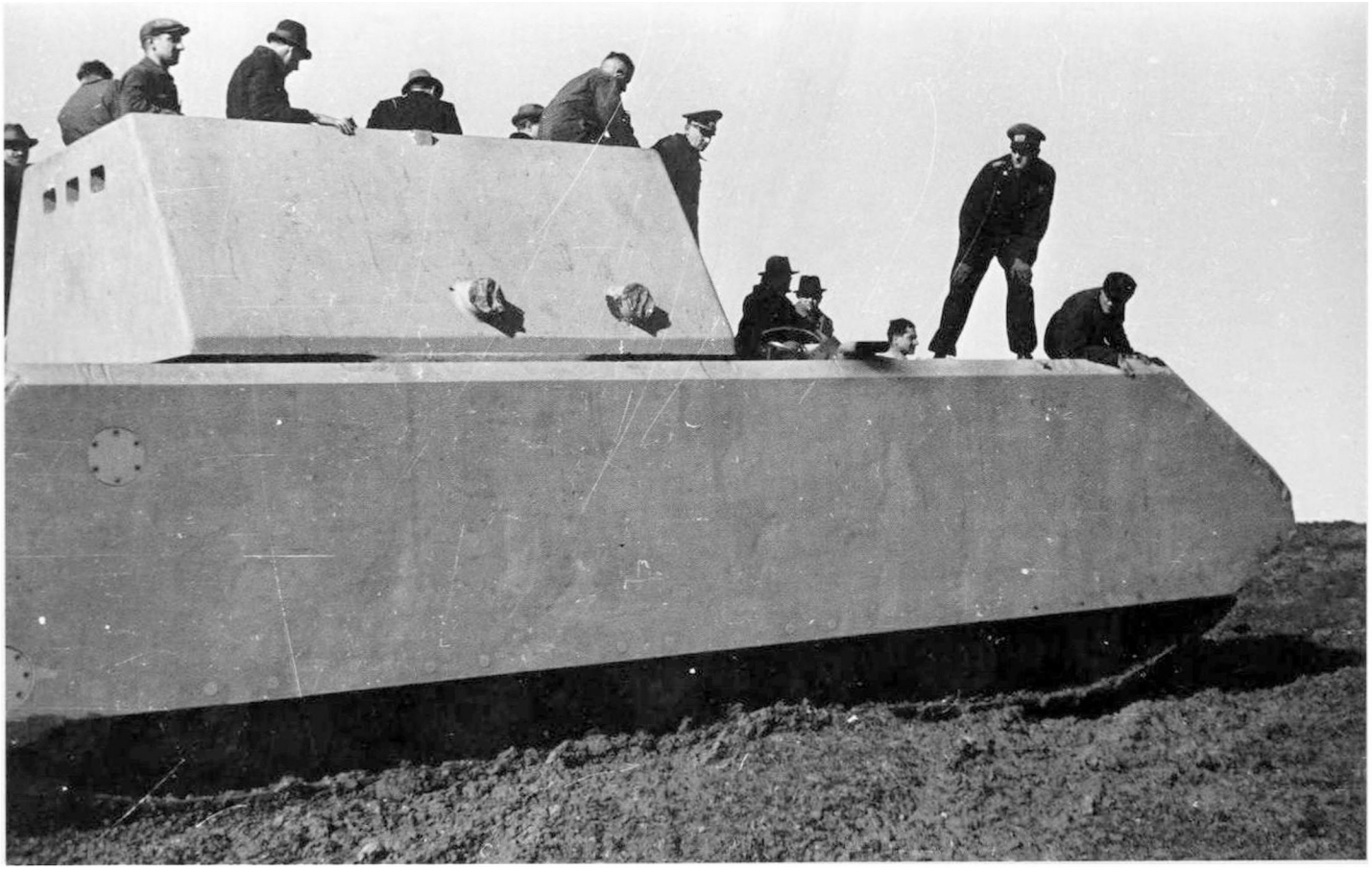
Professor Porsche watches the driving attempts in difficult terrain with a critical eye.

Professor Porsche in conversation with driver Gensberger, Heinz Gröschel, and engineer Leopold Schmid.

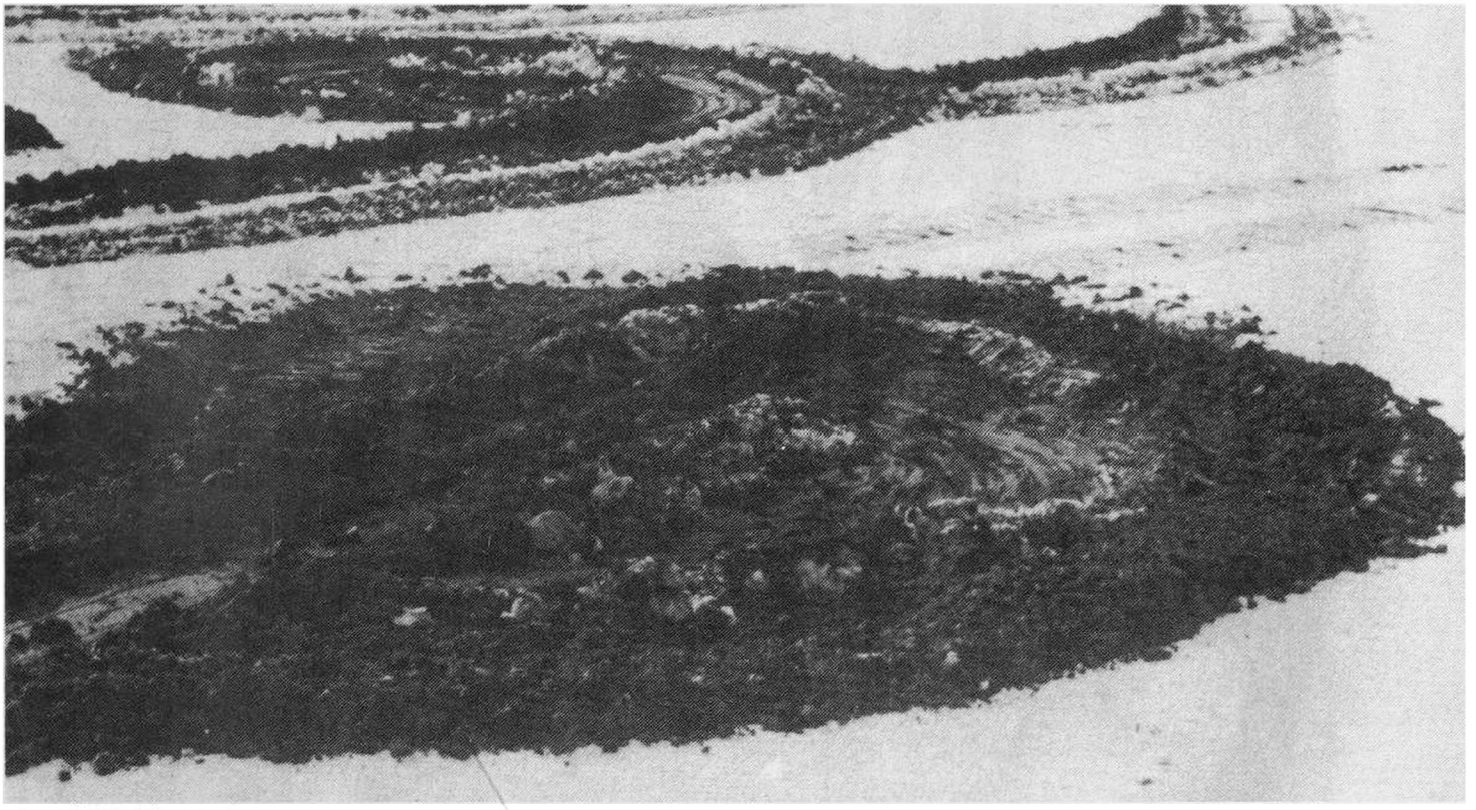
The Maus shows its impressive trench crossing ability.

wheels due to sagging of the rubber inserts was discovered. This had previously been observed on the test bench in the VW laboratory in Fallersleben and work had begun on improved road wheels . Film was shot that day, but it was destroyed by a direct hit on the Porsche company archive late in the war. The new alternators and additional monitoring instruments were installed on February 1–2, 1944. The entire electrical system was again checked. On February 3, 1944, the Maus made a two-kilometer [1.25 mile] test drive in the testing area. Professor Porsche and his engineers were present, along with engineer Schmidt of the Army Ordnance Office's WaPrüf 6 and other officers. The electrical system functioned perfectly. Generator temperatures were normal because of normal excitation and low armature current. The smallest turning circle diameter was 14.5 meters [47.57 ft.] at the forward running track measured from center to center of the track. The smallest turning circle diameter with one track running forward and the other running backward was the oft-doubted turning on the spot (see photo). Maj. Hoffmann of the *Kraftfahrversuchsstelle* (Vers. Kraft – Motor Vehicle Testing Center), based in Kummersdorf-Gut, oversaw the work to complete the tank, as well as repairs and test drives. Further repairs were carried out from February 4–6, 1944: the vehicle was greased, access to the Bowden cable of the battery's master switch was improved, and the hand brake lever was lengthened for better leverage. The next test drive took place on February 7, covering seven kilometers [4.35 miles] on the testing grounds. The program: steering movement on the slope and on the level with wet ground and 20 cm [7.87 in.] of new snow. Turning on the spot was also carried out flawlessly. On February 8, 1944, Professor Porsche and Directors Nallinger and Köhler of Daimler-Benz arrived to take part in a factory drive of 2.4 kilometers [1.49 miles]. The men were interested in the installation of the MB 509 engine and its behavior during the drive. With an outside temperature of 0°C [32°F], the MB 509's coolant temperature was 70°–80°C [158°–176°F], the temperature of the exhaust coolant was 80°C [176°F], the temperature of the engine oil was 65°C [149°F], the electric motors 25°–30°C [77°–86°F], and the generators 20°C [68°F]. A variety of work was carried out from February 9–25, 1944. The piston diameter of the low gear selector was increased to reduce operating forces. The actuating cylinder installed by fitters from the Teve Company of Frankfurt was still not adequate; a lever force of 25 kg [55

Discussion with the officers of the WaPruf.



lb.] was still required and improvements had to be made. So-called "gas pedal actuation" forces were also excessive. The primary cylinder was replaced and the lever ratio modified. During this time the two forward tow hooks and the rear towing eyebolts were also welded in place. The right angle gear heads of the electric motors' speed sensors were remounted. A supercharger impeller with lower boost pressure was installed, as were additional remote temperature sensors for measuring oil temperatures in the reduction gear and planetary drives. The third report on factory testing of the Type 205/1 from February 25, 1944, describes a test drive that covered 5 kilometers [3.1 miles]. Behavior of the electrical



Tracks in the ground testify to the tank turning on the spot. Few other tanks were capable of this.

The plumes of exhaust gas in this photo taken during an ascent are curious, for the black color suggests a gasoline engine burning oil. An engine pumps oil into the combustion chamber when it is rather worn. This was probably the reason why engine performance was later reduced from 1,200 to 1,080 hp by reducing boost pressure for extended engine life.

Maus 205/1, here in the two-color camouflage scheme. The tow lugs are still missing. In the background is Panzerersatzabteilung 7's vehicle hangar, where the Maus was parked and underwent repairs. For cover, the hammer and sickle emblem of the USSR was painted on the sides and rear of the hull (mirror inverted) along with the letters GJP (assuming the script was also mirror inverted and reversed, it should probably read: GRU = Head Intelligence Office Kubinka). The Red Army's red star appears on the left and right sides of the turret. Captured vehicles were often tested at Böblingen, such as the wrecked KV 1 in a previous photo.

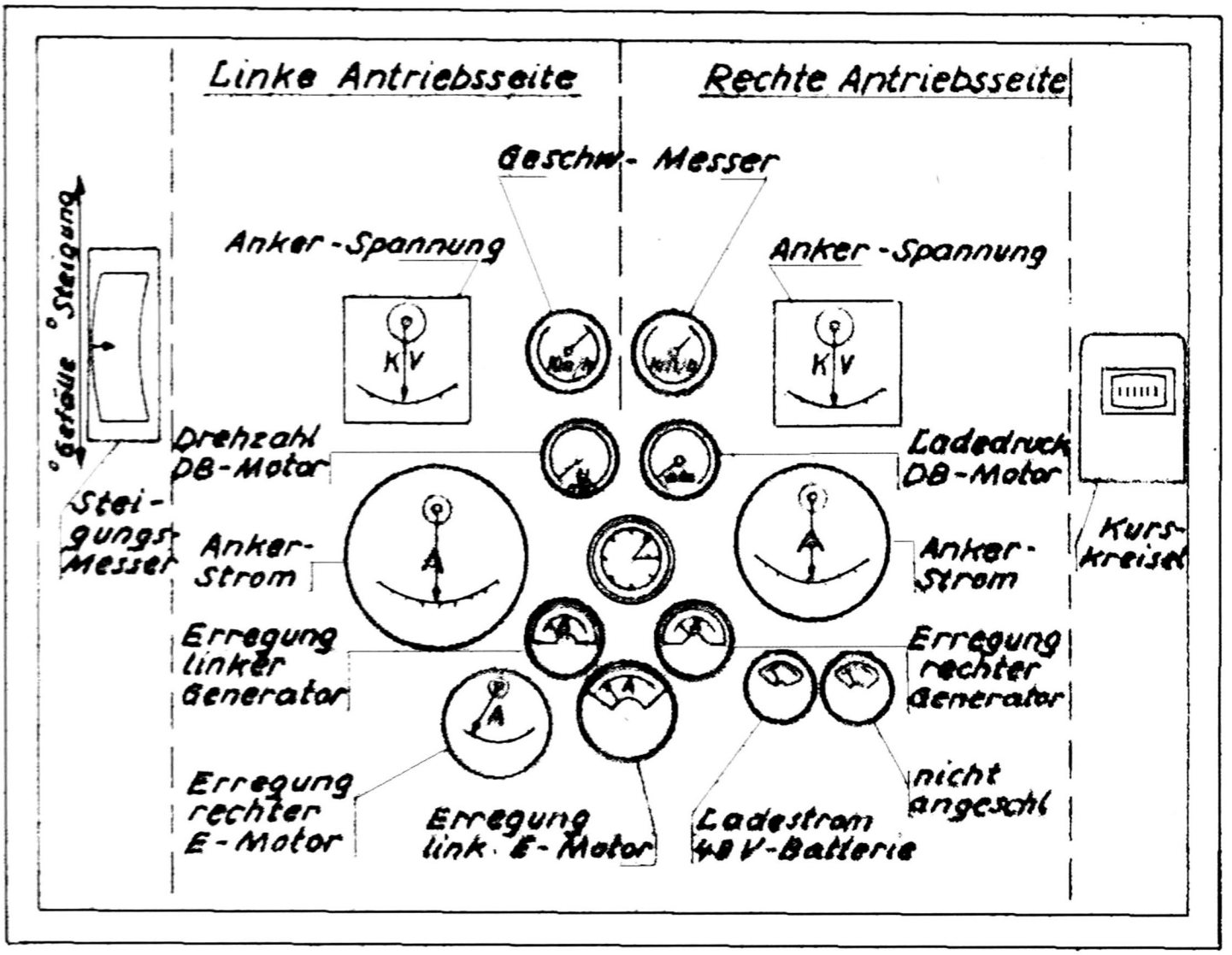
system during turns and straight driving on level ground and grades was checked with the aid of installed electrical indicators. The measured values served as a basis for the coming adjustment of the electrical system and the calculation of power requirements. Subsequent factory trials envisaged:

1. Precise adjustment of the entire electrical system.
2. Drive tests until the arrival of the proper road wheels mentioned on 5/2/1944.
3. Installation of the proper road wheels, with simultaneous check of all drive elements.
4. Installation of new tracks.
5. Completion of component installation.
6. Continuation of test drives on the Böblingen tank training area.

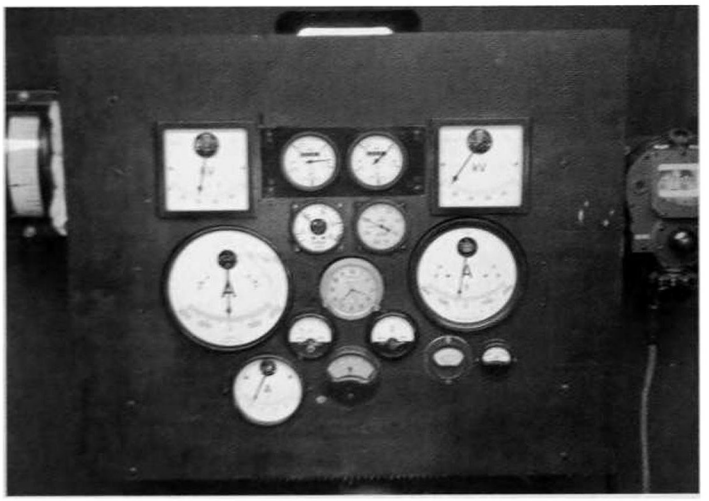
On February 29, 1944, a factory test drive covering half a kilometer [0.31 miles] was completed. Once again, the low gear shifter's lever forces were found to be unacceptably high. Fitters from Teves (later name Ate) did not effect an improvement until March 25, 1944. Another measured drive over 4.1 kilometers [2.55 miles] took place on March 1, 1944. The selected section of road had a 25% uphill grade. Outside temperature was 2°C [35.6°F]. During the test, the temperature of the two generators was 15°C [59°F], the planetary drive 40°C [104°F], and the reduction gear between 70°C and 90°C [158°–194°F]. As a result of the previous tests, between March 2–8, a series of instruments was installed in a panel on the inner front side of the simulated turret. Four lamps illuminated the panel and a rigidly mounted 16 mm camera filmed while measurements were being taken. Its single trigger was operated by a small motor, causing a photo to be taken every two seconds. Moments of special interest were photographed by a rigidly mounted Leica camera. As the instrument panel had a clock with second hand captured in the photos taken by both cameras, a comparison of the photos was easily possible. Only terrain peculiarities, turn radii, gearbox ratios, and steering lever positions still had to be recorded in the measurement record (see record p. 80), as

Professor Porsche, Ferry Porsche, and Karl Rabe conversing.

The Bergepanther recovery vehicle was often present during the test drives.



Sketch showing the arrangement of instruments in the tank's additional instrument panel.



The arrangement of instruments in the tank's additional instrument panel.

everything else could be read from the photographs. The data was read from the photos with the help of a magnifying glass, or the 16 mm film was run with a projector. Concerning the results, it was noted there were difficulties obtaining precise measurements because ground resistance of the terrain had varied sharply and there had been no large areas available with the same ground conditions. This was particularly aggravating when negotiating curves. As first result, it was found the tractive forces corresponded to the calculated graphs and engine power could be used almost to the full. A number scale helped identify the positions of the steering levers that equated to the contacts of the two driving switches. The low gear shifter's hydraulics were switched off and until the new cylinder could be fitted, their place was taken by a hand lever in the rear operated through the ventilation grating. On March 9, there was another measured drive of 5.2 kilometers [3.23 miles]. Maj. März of WaPrüf 6 was an observer. The following conditions had been agreed upon for the test:

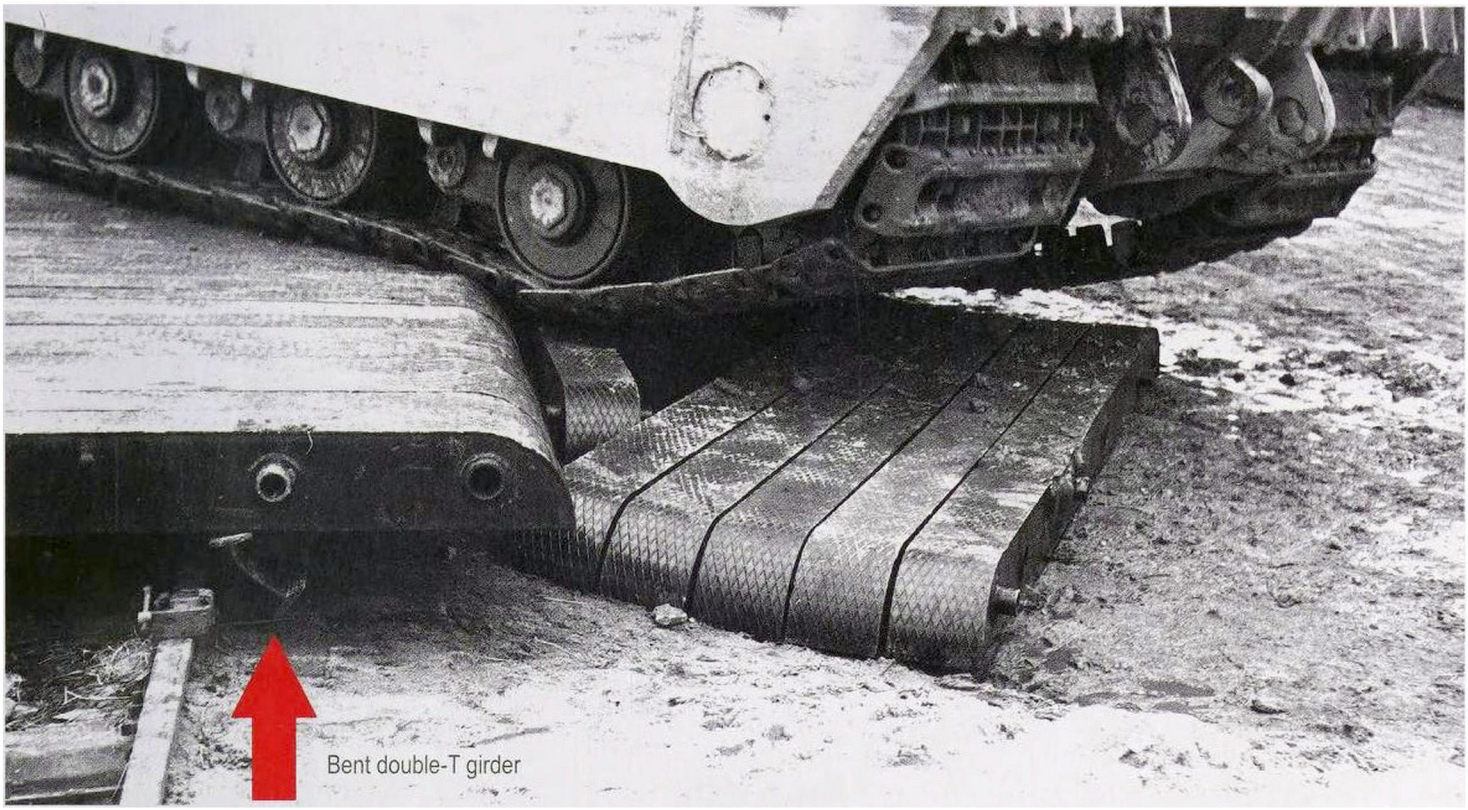
a. one track forwards, one track not powered and not braked
b. one track forwards, one track braked
c. one track forwards, one track powered backwards
d. random turns, turns on the spot
e. climb with 25% grade in high gear
f. climb with 43% grade in low gear

Engineer Zadnik at the steering levers while Gensberger lies beside him.

At four in the morning on March 10, 1944, Maus 205/1 drove to Böblingen air base. The towing lugs are in place. This photo shows the tank leaving the camp grounds, heading north in the direction of the Böblingen railway station. This route was also used during drives in the direction of training grounds. The Bergepanther provides scale, showing the enormous size of the Maus. These recovery vehicles were constant companions, although their usefulness is questionable given the Maus' great weight.

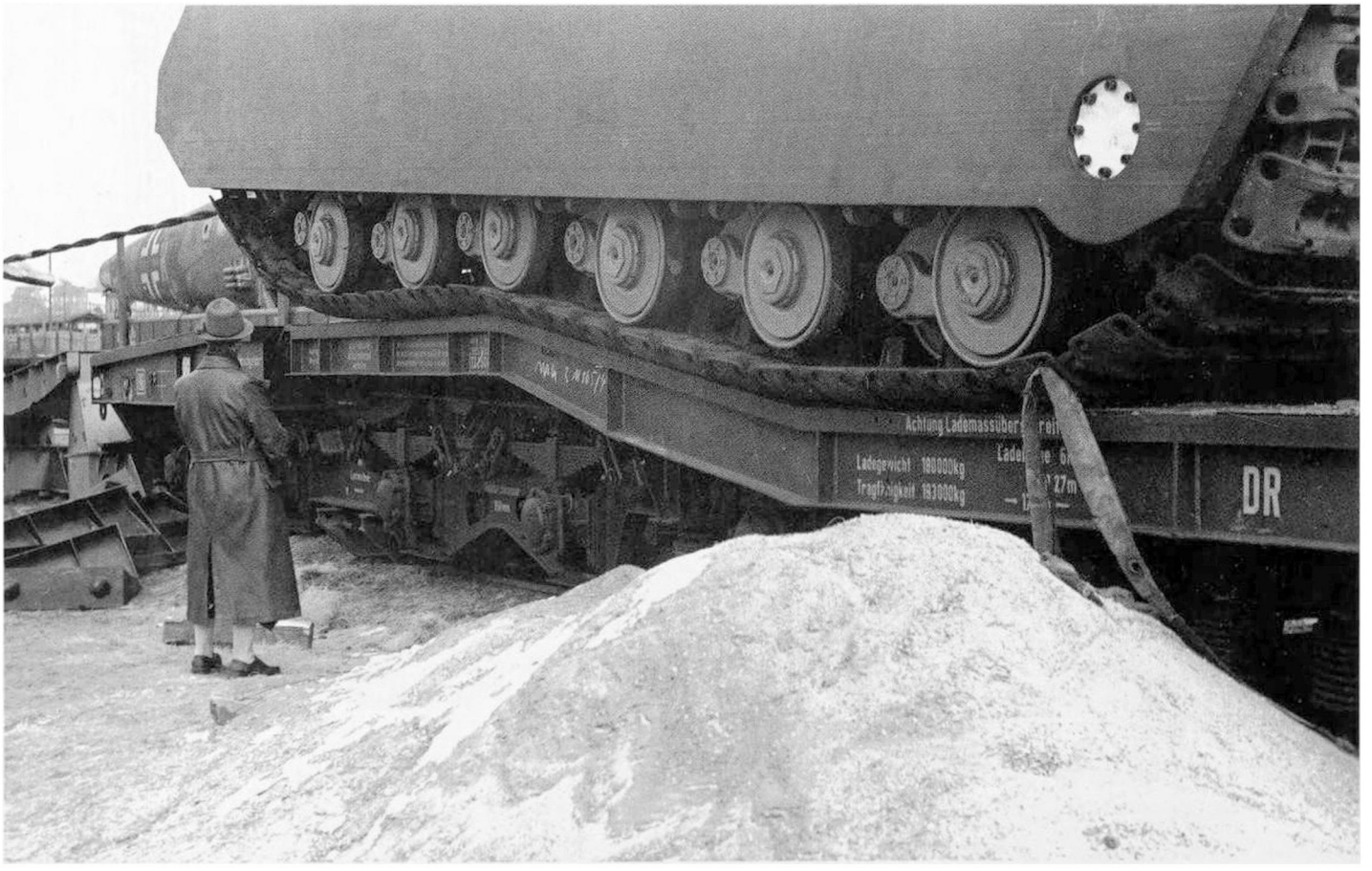
Maus 205/1 (right) tows Maus 205/2 from the special rail car over the positioned loading ramp and subsequent loading road with the help of a long cable.

Measurement of the achieved turning circle diameters took place in conditions a to d. The first straight-line drive was carried out on the road with a slight gradient of 4.36%. The temperature was 0°C [32°F] and the ground was a meadow with a fifteen centimeter [5.9 inch] deep coating of wet snow on loamy, deeply frozen soil. A speed of 8.5 kph [5.28 mph] resulted in an overall traction of 16.92 tons at a traction resistance of 94 kg/ton [207 lbs/ton]. From measurements of current and voltage, engine performance was calculated as 758 hp. In the opposite direction an engine performance of 800 hp and an overall traction of 11.32 tons were calculated at a speed of 13.7 kph [8.5 mph]. Traction resistance with a



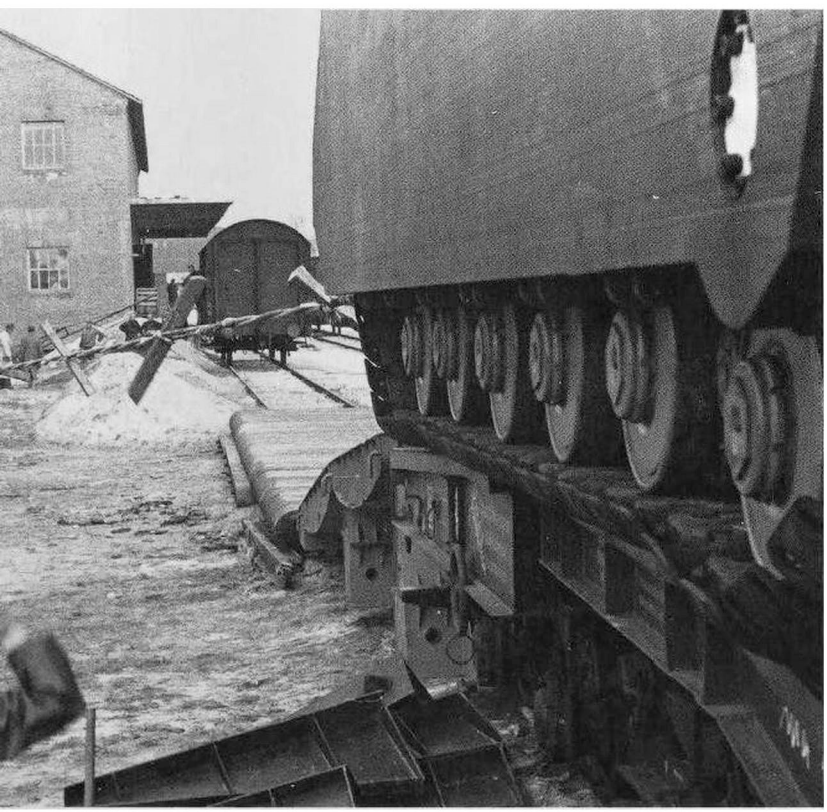
A first attempt was made to tow Maus 205/2 from the car with the help of the short towing installation and would have required Maus 205/1 to also drive onto the rail car and loading ramp, overloading both of them. The wrecked double-T girder in the photo was warning enough.

gradient of 4.36% was 63 kg/ton [138.9 lbs/ton]. There followed further measurements with just one powered track in low gear and various turn radii, a gradient drive with subsequent electric braking, and a drive in high gear with a 26.8% gradient. The climbs were made without overstressing the engine or electrical system and with no slipping of the tracks. A speed of 2 kph [1.24 mph] was measured on a 46.5% gradient. The engine ran at 2,250 rpm, a figure not even in the high performance range (2,300 rpm). Voltages up to 330 Volts and armature currents to 900 Amperes were reached. At an electrical efficiency of 0.9, calculated engine performance was 890 hp. The following temperatures were recorded after



The support beams between the axles are clearly visible here, as is the large scale of the running gear.

Maus 205/2 is towed from the loading road.



Heinz Gröschel operates the hand brake of the vehicle being towed.

Maus 205/2's towing device.

the drive on March 9 was completed: planetary drives left/right each 12°C [53.6°F], the reduction gear oil sump 100°C [212°F], on the upper reduction gear casing 80°C [176°F], forward generator 38°C [100.4°F], rear generator 40°C [104°F], and electric motors (left/right) 25°/50°C [77°/122°F]. Meanwhile, at Alkett in Berlin, Maus 205/2 had reached the stage of construction where the complete running gear and brakes were installed. On March 6, 1944, in Factory III in Spandau, it was loaded onto the 27-meter-long [88.6 ft.] special wagon with the help of a 150 ton gantry crane belonging to Ardelt-Werke of Eberswalde. *Hauptmann* Lossner of Heaviest Equipment Park West Aschaffenburg directed the transport.

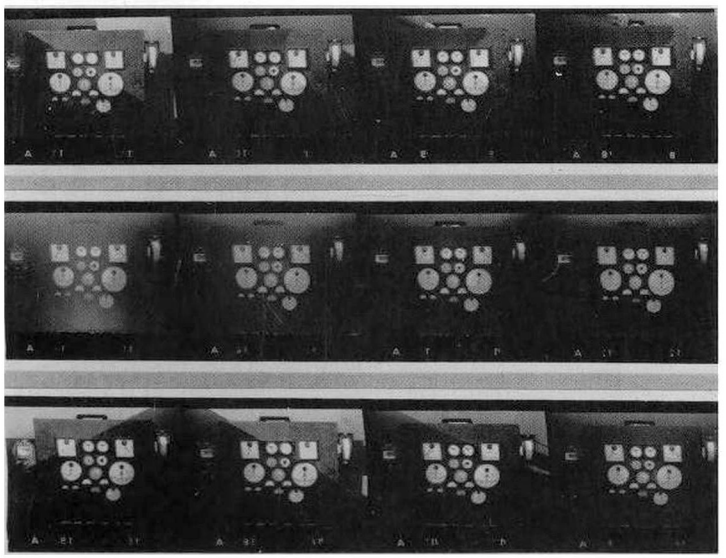
In the foreground is a canvas cover and a piece of shell deflector from Maus 205/2.

The additional instrument panel can be seen through a slot in Maus 205/1's loading weight. An engineer is keeping an eye on the instruments. Air base personnel are also watching the "secret" transport with interest.

Responsible for the transport were the two division presidents of the Reichsbahn headquarters in Berlin: Herr Culemajer and Herr Schröder. The short towing device (a sort of towing bridle) also could not be used at first because the loading bay had been pushed apart and partly destroyed during detraining of the first vehicle on January 14, 1944. The two vehicles coupled close together would have finished off the ramp. Heinz Gröschel, the second factory driver, assisted the steering movement of Maus 205/2 by using the handbrakes. As Maus 205/2 was being pulled off, the locking mechanism under the car capsized. The loading ramp bumper pushed diagonally, even though the steam locomotive constantly

Siemens-Schuckertwerke A.-G. Dynamowerk Siemensstadt proving field on March 14, 1944, in the afternoon.						The second test in terrain. Light fresh snow (approximately 5–10 cm [1.97–3.94 in]) on half-frozen ground (loamy forest ground frozen at depth).
Time	**Gear**	**Radius**	**Direction of Turn**	**Lever left/ right**	**Speed kph**	**Remarks**
						(Zadnik driving)
14:32 14:34	S S	∞	--		10	Straight ahead, full throttle, direction west, level, until slight climb (to the two trees) with minor steering corrections
14:36	S		R			
14:38	G	16-32	R	0		Right track dragging
14:39	G	32	R	0		Radius seemingly independent of speed
14:40	G		R	0		Uphill, radius became smaller
14:40	G	∞				Crossed ditch, back to beginning of turn
14:43	G	12.5	R			Small radius right turn around tree. Right track dragged – until:
14:46	G		R			Turned on the spot, back to starting point.
14:56 to 15:00	G 20 to 30	R				Gensberger drove curve 3. Inner track dragged. (Leica: 9) Gensberger drove Curve 3
15:02	G	~ 10	R			
15:03	G		R			More right turns (Zadnik "tested stick positions"—Zadnik drove)
15:05	G	~	R			involvement
15:07 to 15:13	G 1.5 R	R	L			Turning in place. Turning on the spot and turning back and forth
15:15	G		L			Turning on the spot
15:18	G		R			Turning on the spot
15:20	G		L			Left track dragged
15:22	G		L			90° turn, then straight
15:24	G		RL			Peistrup "test" drove, turns on the level
15:29	G					Zadnik drove again
15:35						Start of the slope (Leica: 17)
15:36						Drove up backward to get out of the mud, down backward, a = -10° to -15°
15:40		∞				Became stuck on slope, hull touching
						Ground. Front of vehicle hanging right.
15:42						a = -12°, backwards again, stuck
15:44	G					Jungwald got it down.
15:46	G		R			
15:47	G					Beginning of slope.
15:48	G					Beginning of slope, start of steep grade
15:48	G			~2		a = -23° (max.)
15:49	G					a = 8 n = 2,000–2,200
15:52	G		L			Left turns on the hill R = 3 m [9.84 ft]
15:54	G		R			Right turns on the hill. Start of the long drive in terrain: down to the road, east on road, forest road, open clearing. In small wood two damaged beeches knocked over (D = 40–50 cm [15.7–19.7 in]), crossed stream bed, test track with large bumps
~17:00						Drove on road, turning on the spot (Gensberger drove)
17:35						Returned to workshop.

The additional instrument panel can be seen through a slot in Maus 205/1's loading weight. An engineer is keeping an eye on the instruments. Air base personnel are also watching the "secret" transport with interest.



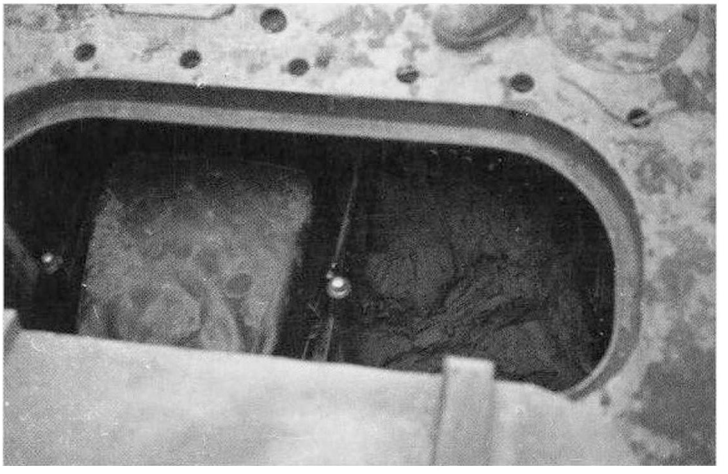
Seen here is part of a series of photos taken by the fixed 16 mm cine camera during trials on March 14, 1944 (see p 72).

exerted counter-pressure. When Maus 205/2 had solid ground under its tracks, the specially created towing mechanism was mounted between two tanks. Only the connecting pins had not been completed, so they had to manage with cables. The towing vehicle was thus able to assist the towed vehicle during steering and braking. Using the two hand brakes, the second driver helped steer and brake. The towing unit was parked at nearby Böblingen air base until evening. For secrecy, the transport from Böblingen air base to the barracks of Panzerersatzabteilung 7 did not happen until night. Despite ninety degree curves in the road and a completely ice-covered forest road with a grade of twelve percent leading to the barracks, the transport was completed without incident. After two hours of engine operation, Maus 205/1 pushed Maus 205/2 into the factory hall earmarked for its completion (the

The hull bottom first had to be freed from the mud and the grip of the tracks bolstered by tree trunks placed beneath them. Digging away the mud on the sides and in front of the tank reduced static friction, making it easier for the Maus to get itself out.

"Porsche workshop" without difficulties. A ten kilometer [6.2 mile] measured drive took place on March 14, 1944. The plan called for it to climb grades of 43% in low gear and ford meter-deep [3.28 ft.] waterways with a subsequent climb of a 45% grade. The ground was muddy, with an outside temperature of +3°C [37.4°F]. The measured operating temperatures were thus within the normal range. The engine coolant temperature was 65°C [149°F], exhaust cooling 80°C

The entire hull bottom is in contact with the ground, consequently, the tracks no longer have the necessary ground pressure to grip.



Mud enters the driver's compartment.

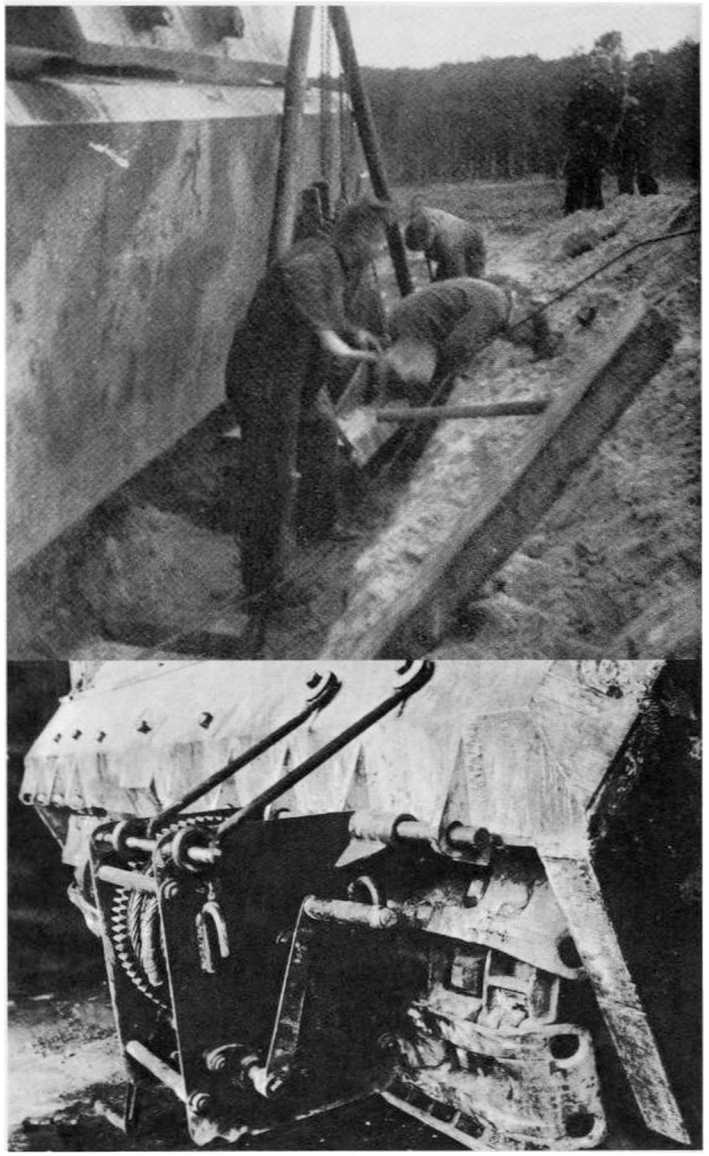
[176°F], engine oil 50°C [122°F], the planetary drive and generators 30°C [86°F], and the left reduction gear 140°C [284°F] (in the oil sump) and the right 90°C [194°F] (after the oil pump). The values measured on March 9 were confirmed. Here is the record of this measured drive: from March 15–17, there was a four-kilometer [2.49 mile] measured drive on soft ground. The drive crossed streambeds and water one meter [3.28 ft.] deep with a subsequent 45% grade. The report noted Maus 205/1 became stuck during a drive in a marshy water source area due to inadequate local knowledge on the part of the driver. As later discovered, even Panzer-Ersatz-Abt. 7 Böblingen's light training vehicles avoided this spot. By digging out the mud heaped behind the tank and placing logs under the tracks the vehicle was able to free itself under its own power. This is described in the third report on factory testing. Here the minutes were glossed over somewhat, for Ghislaine E.J. Kaes, the previously quoted private secretary of Professor Porsche, wrote in a letter dated July 4, 1967:

On the test drive area in Böblingen there was a swampy spot that driver Gensberger always avoided—always went around when driving the Maus. When Professor Porsche learned of this, he said to Gensberger he should drive through the swamp. Gensberger was reluctant at first, then he gave in. The Maus sank to two meters [6.56 ft.] in the mud and remained stuck there because the edge of the swamp was eroded and washed away and the nose of the Maus was unable to lift the edge well from below. Professor Porsche first had the Maus' passengers—the engineers—brought out of the swamp in a Schwimmwagen. After this the pioneers had to fell trees. Then the Maus drove out on its own power over a tree road and freed itself. With the back and forth about driving into the swamp, Gensberger had forgotten to close a ventilation flap in the floor (the emergency escape hatch at the foot of the radio operator's seat). As a result, mud entered

Drainage ditches were dug. The work took almost two days. Then the Maus was able to crawl out of the mud under its own power, leaving behind a deep, muddy hole.

Pioneers have brought felled tree trunks to the marshy hollow to place them beneath the tank's tracks

Cleaning up after the self recovery. Left behind is a huge muddy hole.

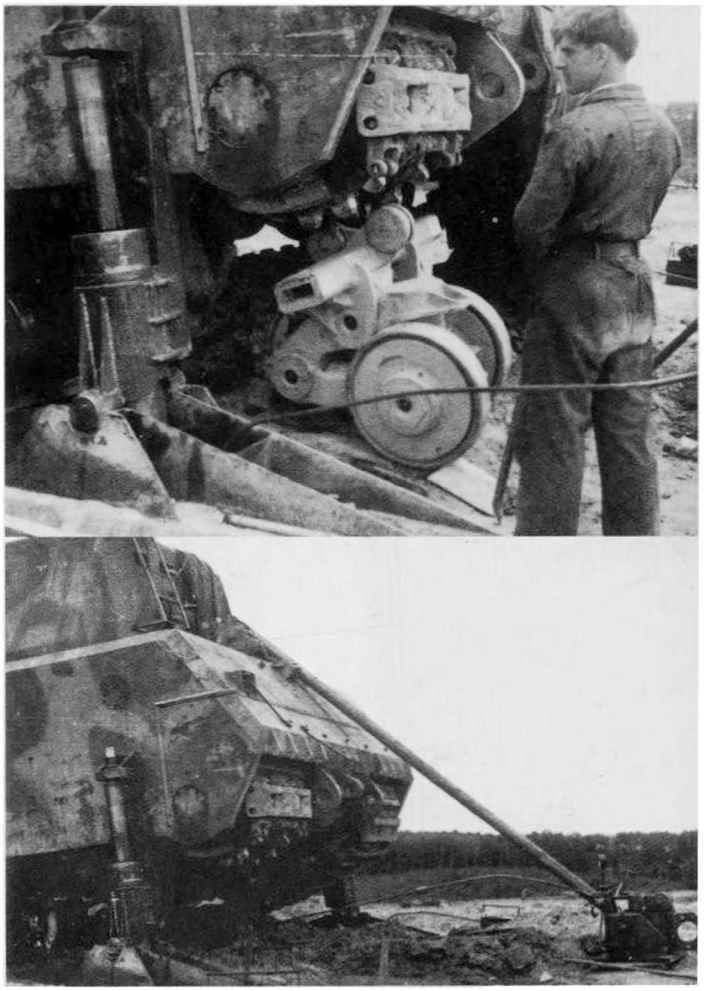


The track winch is installed on the rear of the tank as a mounting aid. Indispensable help for the stuck 112-link track, which weighed just under four tons.

the driver's compartment. Once the tank had freed itself from the swamp the first thing the driver had to do was go and wash.

As to the character of Professor Porsche, a quote from the letter by Ghislaine E.J. Kaes could be added:

> It was in the summer of 1944. Professor Dr.Ing. h.c. Porsche asked driver Karl Gensberger about the maximum speed. He replied that he drove at 10 kph [6.21 mph] at most. But then Professor Porsche told the driver to get out. Though approaching 69 years of age, he took the controls, took off, and achieved 20 kph [12.4 mph]. That was the highest speed reached. ... That's how he was, the designer Professor Dr.Ing. h.c. Porsche.



Good view of the retrofitted cable of the sensor on the planetary drive.

The vehicle was jacked up for installation of the improved road wheels . The drive components, such as the engine, electric motors, reduction gear with brakes, and planetary drives were removed and disassembled for intermediate checks. This concludes the report of March 20, 1944. This work took a great deal of time. An attempt was later made to change a bogie set under field conditions. The series of photos shows one side of Maus 205/1 was jacked up using three huge hydraulic jacks. To get at the running gear the earth next to it had to be cleared away. Poor accessibility of the running gear was a big disadvantage of the Maus' integral track guards. On April 1, 1944, Vers.Kraft Kummersdorf-Gut reported on the state of testing. It observed that rapid loading and unloading was possible with the 27-meter-long [88.6 ft.] special wagon, but the 6 × 3 meter [19.7 × 9.84 ft.] loading ramp and loading alley were too small. It was also noted the MB 509 gasoline engine was not running satisfactorily with available 77 octane gasoline; consequently, 0.33% B 4 aviation gasoline or 0.09% tetra-ethyl lead mixture had to be added. The field of view of the driver's periscope was insufficient; it did not include the area immediately in front of the tank and had to be improved. On later hulls a cutout was made in the

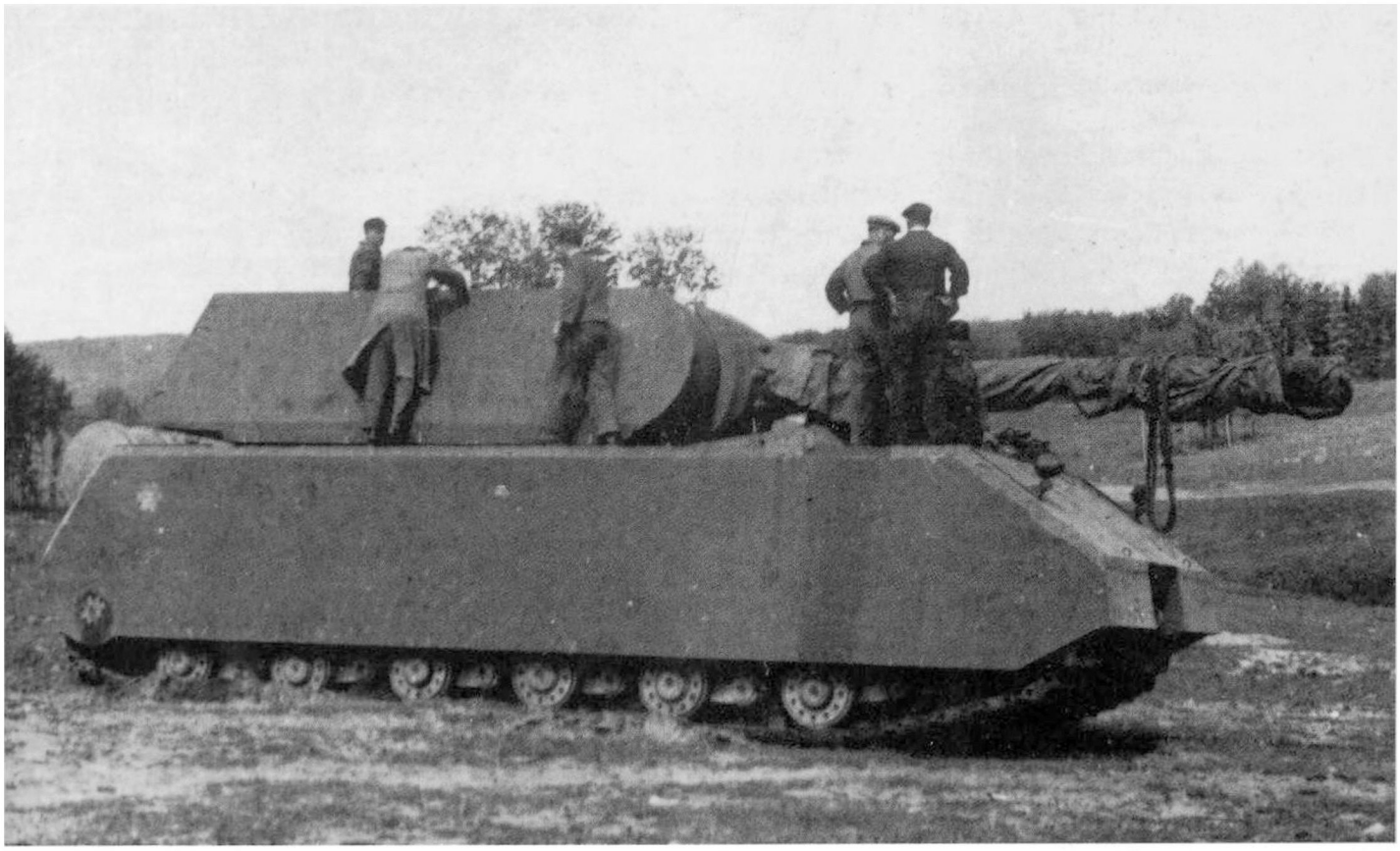
The new 800 kg [1,763 lbs] bogie set is pushed under the tank.

edge of the front plate. On a positive note, it was discovered the ability to steer effectively on firm and muddy ground was due to the separate track drives and the upturned ends on the track plates. The mechanical brakes appeared adequate to restrain the vehicle. Necessary improvements included the need for new road wheels and improvement or lengthening of the track tensioning spindle. Hydraulic shifting into high and low gear also had to be made easier, as operating forces were still too high. This also ends the information on Maus 205/1, which together with Maus 205/2 was transferred to the army research facility at Kummersdorf-Gut at the end of October 1944. It should also be mentioned the lifting eyes (the bollards for lifting the turret weight by crane) had already been burned off at Alkett to ease access to the electric motors in the rear of the tank. By then the turret weight was not going to or could no longer be removed. The OKH contract had already been reduced to one turret by that time. It was thus clear that the single prototype turret still under construction by Krupp could only be fitted to Maus 205/2. As early as November 1, 1943, at an OKH conference it was decided under Point 3, "Scope of Delivery," that "1 chassis with load weight (1st Maus), 1 complete tank (2nd Maus), 1 set of spare parts, 1 diving installation and 1 towing installation" were to be delivered. This ends speculation that the prototype turret was intended for Maus 205/1, especially as this is supported by the different camouflage finishes applied to the two vehicles. Its subsequent fate will be addressed in the following two chapters.

Maus 205/2 – The Complete One

Assembly at Böblingen

As previously described, Maus 205/2 arrived at Böblingen air base's loading siding on March 10, 1944. It had only been assembled to the degree required for towing. The only external difference compared to 205/1 was the additional bullet deflectors in front of the two fuel tank filler points. It had the complete running gear with tracks, reduction gear, both planetary drives, and mechanical brakes. Final assembly was supposed to take place in Panzer-Ersatzabteilung 7's factory hall in Böblingen, with the work being done by Krupp fitters. This procedure was adopted since Alkett Berlin lacked the required capacity. The prototype turret sent from Krupp on April 21, 1944, did not arrive in Böblingen until May 3. It was unloaded at the air base and was stored there for the time being. Installation of the electric system remained and the guns were missing. Acceptance firing of the 128 mm KwK 44 did not take place until May 4, 1944, at Krupp's firing range in Meppen. The two guns arrived in Böblingen two days later and were immediately installed by the Krupp fitters stationed there. Minor repairs to the turret also remained to be carried out, as it had been stored in the open at the air base under a tarpaulin and unidentified parts of it had been removed. Since then, the turret had been watched by guards. During the night of June 8, 1944, the turret was placed on Maus 205/2 with the simplest of means. The new tracks and improved road wheels were installed. Driving of 205/2 began in Böblingen in June 1944; it drove better than 205/1, as the prototype turret weighed "just" 51 tons, compared to the 55 tons of ballast weight. Another cause for speculation has been the question of which engine was installed in Maus 205/2. There are ample photos of Maus 205/2 being driven from July to August 1944, but the MB 517 diesel engine could not be delivered until October 1944; it was therefore only possible to install the MB 509 gasoline engine, for it was available in large numbers. That was, of course, associated with the various modifications that had to be carried out, as the air intake and ventilator drive had to be changed and the intermediate gearing to the generator installed. A letter from Porsche to Krupp on August 4, 1944, also confirms that a



This photo was taken prior to 22 June 1944. The vehicle's color is still RAL 7021 Panzergrau. The gun is wrapped in a tarp and the new road wheels (with holes) are fitted. Signs of fuel leakage are visible.

gasoline engine was installed in 205/2: "...that there has been no driving for three weeks now, because amongst other things a new engine is being installed." (Just two diesel engines were available as of October 1944.) The report detailing the trip to Stuttgart-Böblingen by a Herr Lettmann of Krupp Company states particularly that the gasoline engines were causing difficulties. They had valve damage and were supposed to be removed. In contrast to Maus 205/1, there are no Porsche Company reports on the testing of Maus 205/2. There are five reports about visits to Böblingen by Herr Krause and Herr Lettmann of Krupp's Artillery Design Department. It is reported for the period June 7–16, 1944, that the visit by *Generaloberst* Guderian scheduled for June 11 did not take place. Instead, the elevating drive had to be removed because the pinion bushing had shifted. With the turret mounted, the play between the bottom edge of the turret and the top of the vehicle was 28/23 mm [1.10/0.91 in.] left and 22/17 mm [0.87/0.67 in.] right. The first number is the distance with the turret raised, the second with the turret lowered. The gap was filled with Teroson putty.

The rotating periscope insert provided by WaPrüf 6 (T. Rbl. F.) was unusable, as it was configured for installation at 90° and not 60° as required. Criticism was leveled at the antenna accessory container on the roof of the turret, as it restricted the commander's field of view, and Porsche was directed to find another attachment point for it. Porsche was also required to install an insulating plate on the antenna deflector to avoid antenna background noise. From June 23 to July 2, 1944, it was reported the vehicle was unserviceable because there was excessive play between the gun elevating mechanism's pinion and sector gear and adjustment was required, so no testing of the traversing system in the field was possible. The time was used to raise the amount of 75 mm ammunition stored in the turret from 59 to 85 rounds. The right half of the platform was designed to be removable for better access to the ammunition in the hull. Organizationally, it was decided another welder was needed from Alkett. After consultation with Senior Engineer Rabe and Engineer Zadnik, the decision concerning design work on the Maus II turret had to be postponed, as Professor Porsche was out of town.

Test Drives by 205/2

Maus 205/2 resumed driving tests on July 10, 1944, that continued until the seventeenth. The turret traverse mechanism was tested on the ten-degree slope in the presence of Maj. Hoffmann (WaPrüf 6). Rotating a turret on a slope always requires a great deal of power. The turret of the Russian KV II, for example, could not be traversed on a slope at all. It is not surprising that the turret traverse slip clutch had to be

This is how the power of the turret traverse mechanism was tested, with the Maus on a slope and workers sitting on the gun to increase resistance. One can also see that no ball mounts for submachine guns have yet been installed in the turret sides.

preloaded another 2,000 kg [4,409 lb.]. The expenditure of energy on the auxiliary crank was 50 kg [110.2 lb.]. Use of the power traverse was not possible, as the Siemens transformer was unserviceable. It was very noisy, even though it had been retroactively mounted in rubber. Control was negatively affected by strong arcing. The carbon brushes had raised themselves and had to be reworked. Despite this repair there were still difficulties with the transformer, because excitation voltage was very high. An electrician had to be brought in from Krupp before the problem could be solved. Various items of turret equipment, including the ammunition racks for the 128 mm ammunition, had not been delivered, causing further criticism. Otherwise, the driving tests were satisfactory. It was thought the Maus would not be expected to make test drives on the difficult Berka testing grounds. The tank's high specific ground pressure showed itself in turns on cobblestone paving, which was completely torn up. Fuel consumption was 350 liters per 10 kilometers [92.5 gallons per 6.21 miles]. The gasoline engines and the tracks were particular sources of trouble. The gasoline engines had problems with valve damage and had to be removed. The plate tracks initially used had proven unsuitable and were replaced with better gripping tracks from Skoda. Changing the tracks in the workshop took six workers eight hours. Several links in the new tracks were soon broken due to overstress. Two submachine gun ball mounts for the turret sides were sent on July 12, 1944. They were found to be damaged and lacked the required traverse angle and were sent back. The Krupp fitters had to carry out various follow-up work in the turret as of July 19, 1944. The ball mounts for the submachine guns had still not arrived, the right parts of the turret platform and ammunition racks for the 75 mm ammunition between the 128 mm racks remained to be installed, the cradle lock support had yet to be supplied, the compressor resistor had to be installed, the gun elevating drive had to be reset to eliminate play, and the left side twelve o'clock indicator had to be recalibrated. There is a report about the test drives that states:

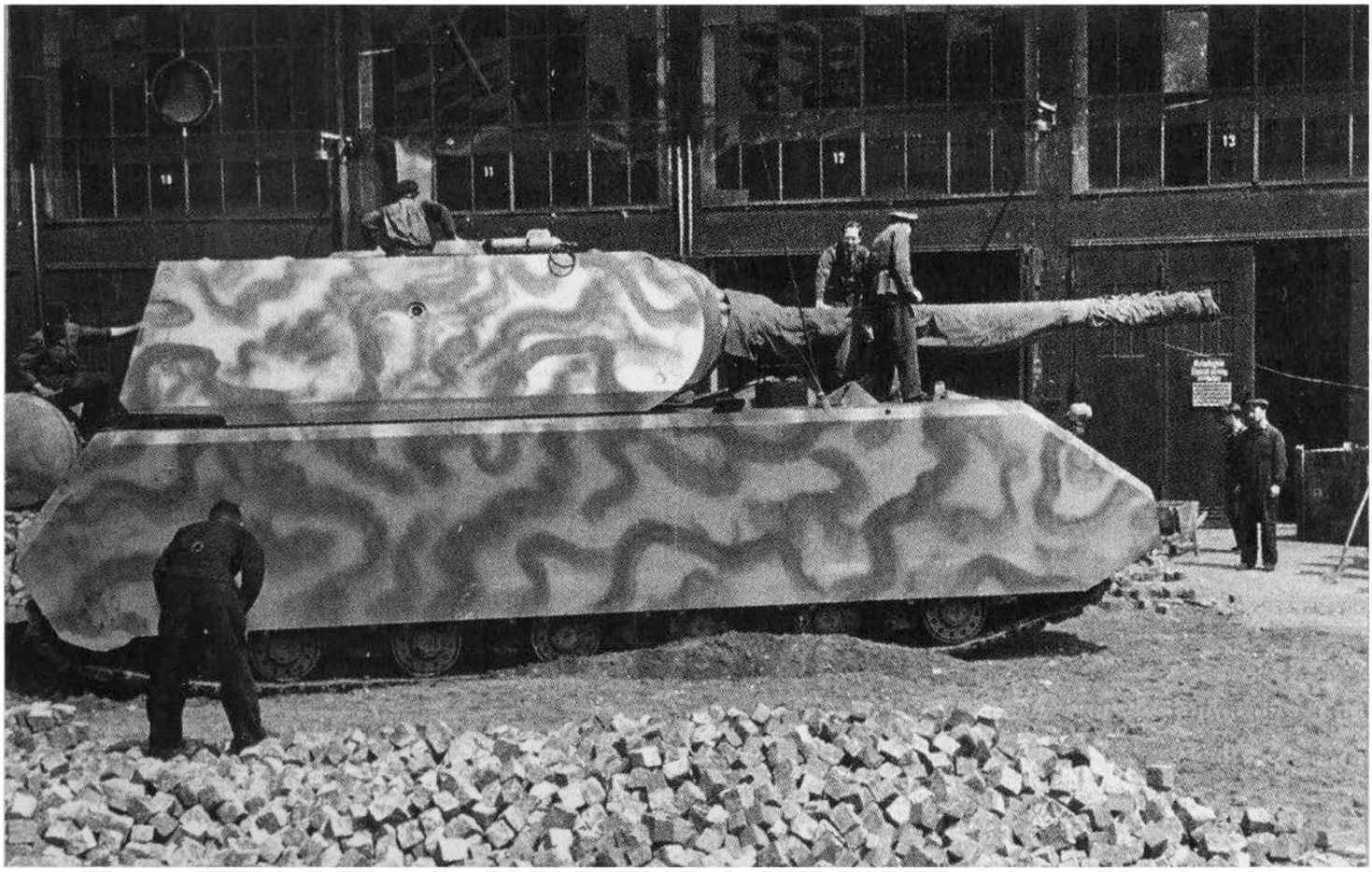
> … as steerable as a normal heavy tank. No one had thought that possible, and when Speer test drove the first prototype and [Speer had gradually learned to drive tanks], he tried to demolish the steering and track by continuously turning on one track in a quarry, but he failed. Porsche had accomplished an incredible feat of design—albeit a complete dead end. He only fully realized this after the war. (Quint, *Porsche, Path of an Age*)

On July 25, 1944, 24 rounds of 128 mm Type 43 (untempered) ammunition with a unit weight of 28.3 kg [62.4 lb.], together with a new T. Rbl. F3 periscope, were sent to the "Porsche workshop in the Hindenburg Barracks" in Böblingen. The first and second batches, each consisting of 500 rounds of Pz.Gr. 43 128 mm ammunition, arrived from assembly in Meppen on July 28 and August 1. The 128 mm high-explosive shells remained under test at the Krupp range in Meppen until August 16, 1944. On August 4, 1944, Porsche urged Krupp—especially Herr Lettmann—to have its fitters put the turret traverse mechanism in order. The traverse transformer armature still had to be balanced. Also a new brake cylinder from Teves was still being waited on. This would have been a good time to do the work, as a three-week driving pause by 205/2 had been scheduled for installation of a new engine. All remaining work on the turret had to be completed during this time. On August 19, 1944, Krupp and Porsche received orders from the OKH to halt development of the Maus. The first test of the Porsche 205/2 with the 1,200 hp MB 517 diesel engine took place in September 1944 (according to Pawlas, the MB 517 was installed in Böblingen at the beginning of October), after which it was transported to the army proving grounds at Kummersdorf. The engine was not supposed to be started until it got there and then it broke down due to faulty installation. The crankshaft broke as the generator was misaligned with the engine (*Weapons Review Nr. 19*, p 3050). In his book, Spielberger wrote:

> Before the end of 1944, an inquiry was received from a Waffen-SS office, asking for an MB 517 for special use. A message dated December 1, 1944, stated it would take at least two weeks to complete the engine, which was in storage in the factory in Untertürkheim. It was suggested this lone engine not be released, especially as production of the MB 507 had ended and no spares were available. The MB 517 installed in the Porsche tank was still in Böblingen and was needed there for further trials.

The other MB 517 engine (only two are known to have existed) was at Daimler-Benz in December 1944, so the report from early October 1944 about the defective engine in Kummersdorf cannot be correct. How could the 205/2 supposedly not have driven again until March 1945, although Maus 205/2 was extensively tested at Kummersdorf by test drivers Behnisch, Hantschick, and later Zebitz? After factory trials by Porsche at Böblingen, at the end of October, both Maus tanks went to the army proving grounds at Kummersdorf-

June 22, 1944: Maus 205/2 now has a three-color camouflage finish (RAL 7028 Sand Yellow, RAL 8017 Brown, and RAL 6003 Olive Green) and has just driven out of Porsche factory hall No. 12. A Bergepanther recovery tank is on the left, in the hall behind Gate No. 11.



The Maus has turned to the right and pushed earth together. The dislodged paving stones were also caused by the Maus. Workers are busy repairing the damage.

The cobblestone pavement is completely destroyed. Ferry Porsche (*Mein Leben*) wrote: "However, when once we demonstrated this [turning on the spot] on a cobblestone square at the military barracks in Böblingen, afterward it had to be completely repaved." In the background is a very rare example of the tracked VW-Kübel.

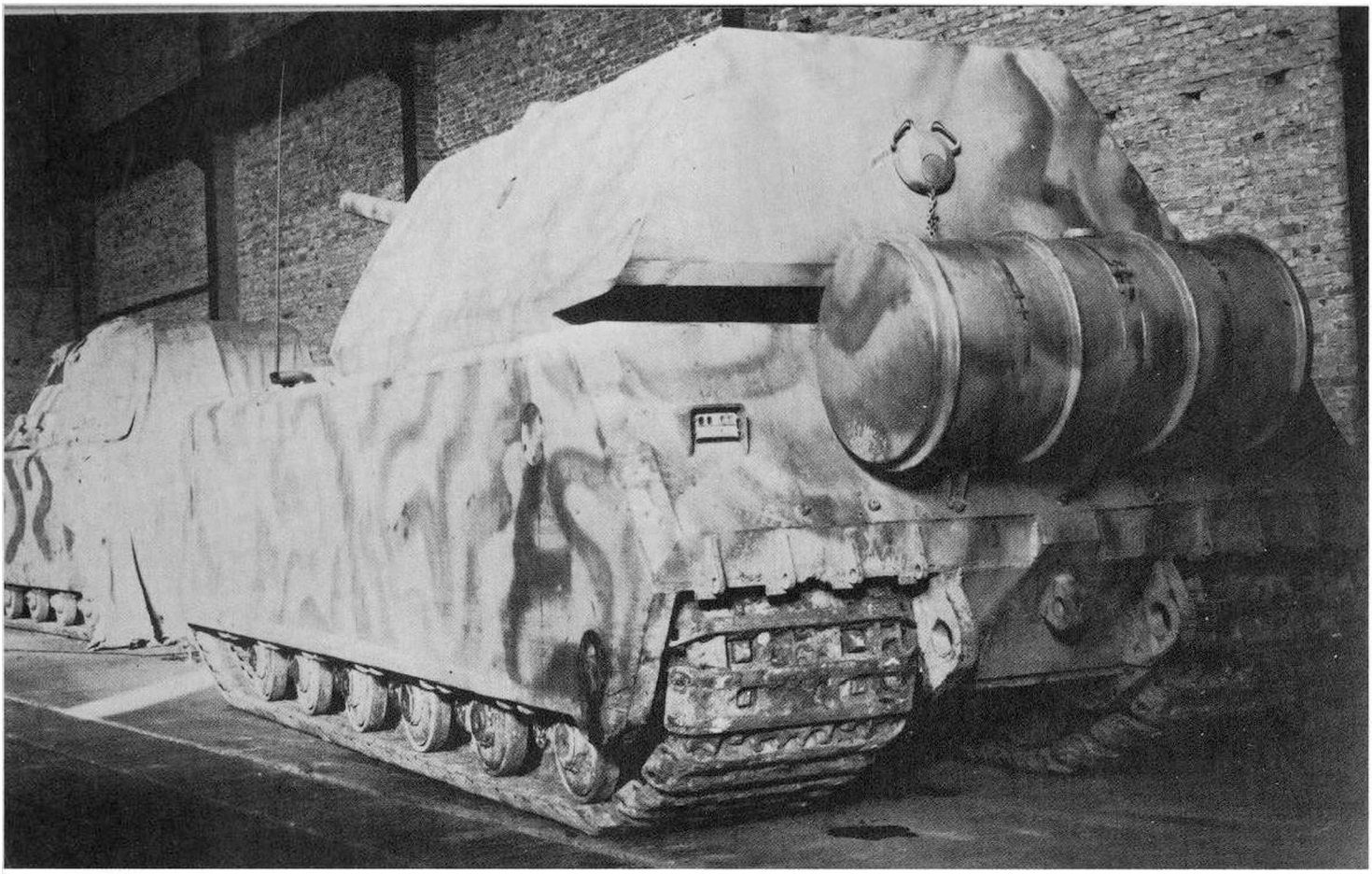
The drive on the cobblestone street continues. In the background are the Maus' old plate tracks now set aside.

And now it heads into the field of the testing grounds at Böblingen.

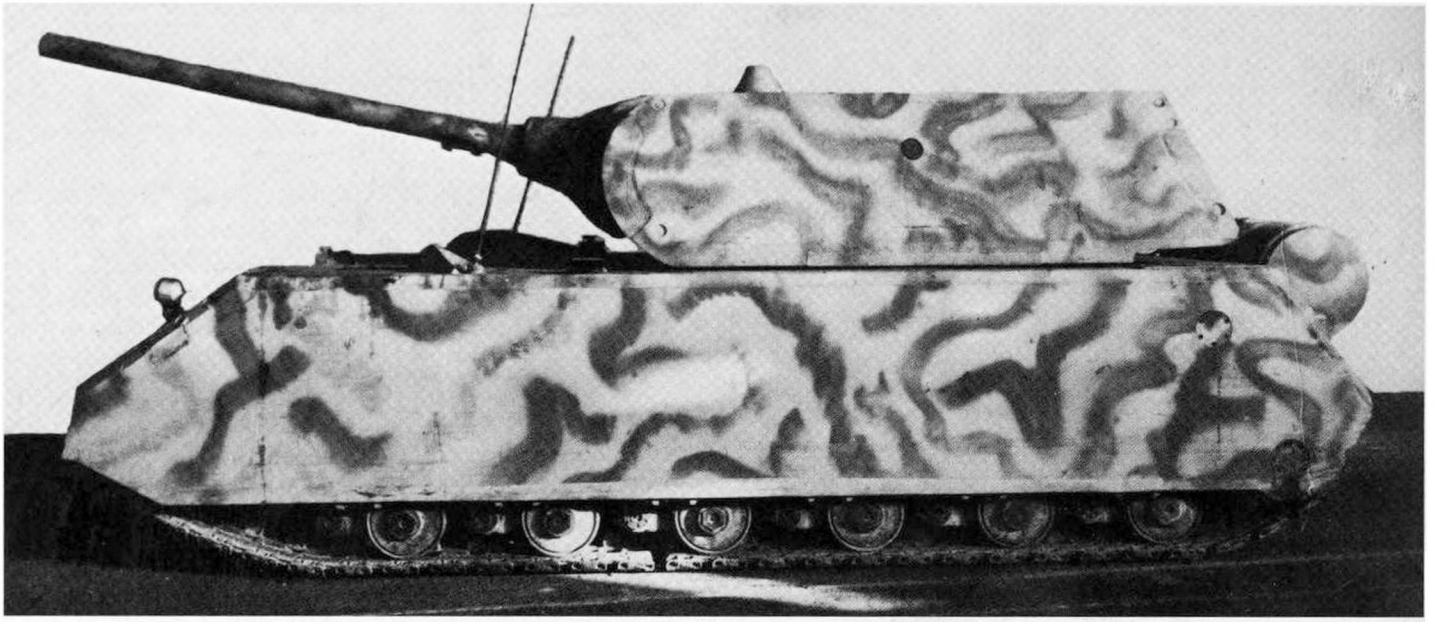
Erwin Komeda and Ferry Porsche. The young man in the middle is unidentified.

The interlocking plates are clearly visible. The exhaust is not yet soot covered, as the paint applied on June 22, 1944, is still fresh.

Gut, near Berlin. The problem with the MB 517 diesel engine was described in advance. The department P2 test drivers were Behnisch, Zebitz, and Hantschick. Unfortunately, to date no records of the results have been found. All that is known is that the diesel engine, with its greater power and lower fuel consumption, worked well in Maus 205/2. Whereas the MB 509 gasoline engine's fuel consumption was 245 gal/psh at continuous performance and that of the comparable DB 607A diesel engine was 175 gal/psh at maximum performance, it can be projected fuel consumption on 100 kilometers [62.1 miles] of road would have been 1,000 liters [264 gals] of diesel instead of 1,400 liters [369.8 gals] of gasoline, and off-road 2,700 liters [713 gals] of diesel for 100 km [62.1 miles] instead of 3,800 liters [1,004 gals] of gasoline. Range with external tank would have been increased to 260 [161.5 miles] instead of 185 km [115 miles]. The TWZF 1 sight arrived in Kummersdorf on January 20, 1945. According to an English report, engineer Zadnik told an independent observer—one of those present when earlier vehicles were examined—that the performance of the Maus was equal to



The upper photo, taken in January 1945, shows both "Mice" in a building of the Vers.Kraft Neu. Maus 205/1 is partially covered by a tarpaulin to protect the sensitive photographic equipment.



that of the Panther. To which characteristics he was referring is not entirely clear; in any case, the Maus was very easy to handle and had enormous tractive power, for it was able to negotiate gradients up to 81% (39°), whereas the Panther could only cope with 30° and the Tiger 35°. Ferry Porsche also wrote in his book:

> Testing revealed amazingly few weaknesses in the Maus and none of them presented us with serious problems. The engineers involved in the trials and even neutral observers were convinced the Maus was in no way inferior to the Tiger in terms of maneuverability. In the drivers' judgment—and here too there was unanimity—the big tank was "child's play" to drive, as everything "went electrically." My father himself drove the Maus a number of times and was thoroughly satisfied with the 20 kph [12.4 mph] capability of this quick design.

The Mice Are Blown Up

In March 1945, the front was drawing ever nearer to Kummersdorf-Gut. At the beginning of the month, *Panzerabteilung* Kummersdorf (Tank Battalion Kummersdorf) was formed from elements of the Technical Experimental Company. It had a mixed bag of vehicles and was sent to the Oder Front. On March 31, 1945, *Panzerkompanie* Kummersdorf (Panzer Company Kummersdorf) was created from elements of the Army Experimental Station (Motor Vehicles). It consisted of three tank platoons, an armored reconnaissance platoon, a grenadier escort platoon, and a tank platoon (non-mobile). The vehicles were taken from the inventory of the experimental battalion. The non-mobile tank platoon was supposed to defend Kummersdorf's gunnery range together with a *Volkssturm* unit and a flak unit. Also formed was a tank unit that included the civilian drivers, among them Maus driver Behnisch. With forty-two vehicles, this unit was supposed to be deployed south of Zossen with Battle Group Kaether. This unit was wiped out by advancing forces of the 1st Ukrainian Front near Baruth. Maus driver Zebitz was supposed to drive Maus 205/2 to Wünsdorf to help defend the OKH. One can only speculate the role of the unarmed Maus 205/1. Perhaps it was intended to support the other Maus' drive, as most bridges were not designed for such a load, making it necessary to negotiate water obstacles. A stuck Maus could only be towed by another Maus. In any case, Maus 205/2 took up its position on Hindenburg Square in front of bunker Maybach I (also see chapter On the Trail of the Maus). Maus 205/1 headed west. Whether it was "disposed of" at Firing Range West or whether it simply broke down will probably never be known. In any case, the crew of Maus 205/1 destroyed their vehicle, setting

Soviet troops examine the blown-up Maus 205/2.

off a demolition charge right next to the brake system (see photo). The effect was not comparable to that of Maus 205/2, as 205/1 had no ammunition on board, which would have significantly increased the explosive force. When Soviet troops stormed Wünsdorf on April 21, 1945, the German tank crew blew up Maus 205/2. The assessment of the damage kindly compiled by Wolfgang Fleischer is offered here to give the reader some idea of the presumed chain of events and the degree of damage inflicted:

Damage Assessment Maus Armored Fighting Vehicle (Porsche Type 205/2)

1. Initial Situation

In April 1945, personnel of Kummersdorf Army Experimental Station/Armaments Testing 6 (WaPrüf 6) drove the second prototype of the Panzerkampfwagen Maus (Porsche 205/02) to Wünsdorf. In the second half of April, there was fierce fighting south of Berlin between German forces and units of the 1st Ukrainian Front advancing in northern and western directions (operation against Berlin by the Red Army). Associated with this was the destruction of the tanks at Hindenburg Square in Zossen, which probably happened for reasons other than enemy action. Understandably, there is no available information as to the type of explosive used. The damage assessment is therefore based on the explosive charges and propellant powder for the 75 and 128 mm ammunition that the Maus was to have used in combat.

2. Task

As part of the damage assessment, observations were made as to the causes of the destructions and their sequence.

3. General Conditions

At the time of its destruction, the tank was not equipped with a full complement of ammunition—69 rounds for the 128 mm KwK and 100 rounds for the 75 mm gun. The actual distribution inside the vehicle could have been as follows:

A. 128-mm: 45 rounds (21 armor-piercing rounds, 24 high-explosive rounds) in the hull, beneath the turret, and 24 rounds (breakdown of armor-piercing and high-explosive not known) in the rear of the revolving turret.

B. 75mm KwK: 75 rounds 75 mm 38 HL/C in the hull, beneath the revolving turret, and 25 rounds 75 mm (breakdown of armor-piercing, hollow charge, high-explosive or smoke shells not known) to the right of the 75 mm gun. The ammunition racks showed no sign of damage after the blast. From this it can be deduced they were not full at the time of the destruction of the tank.

C. Ammunition for the MG 34 machine gun (1,000 rounds), also 326 LP grenades and smoke candles. Orange 160 smoke signals and *Leuchtgeschosse* R flares were not taken into account. Preference had been given to the 75 mm *Granatpatrone* 38 HL/C round for the 75 mm KwK. It could be used in place of the 75 mm *Sprenggranatpatrone* 34 high-explosive round, albeit with reduced fragmentation effect. The resulting values for the explosives and propellant charges for the cannon armament's ammunition complement are thus:

a. Explosives approximately 175–180 kg [385.8–396.8 lb.].
b. Propellant powder about 700 kg [1,543 lb.].
c. Total 875–880 kg [1,929–1,940 lb.].

It is assumed that additional explosives were used to initiate the destruction of the tank. The basic equipment of each tank was supposed to include two *Rohrzerstörerladung* Z (barrel destruction charges), one of which was envisaged for destruction of the guns, the second for the propulsion system. Pioneer demolition charges (i.i., 1- or 3-kg [2.2–6.6 lb] charges with time delay fuses) may also have been used. In the absence of verified information, their explosives could not be included in the calculation. Furthermore, it is assumed the hatches were closed before the charges were set off (tamping effect).

4. Course of Events Scenario

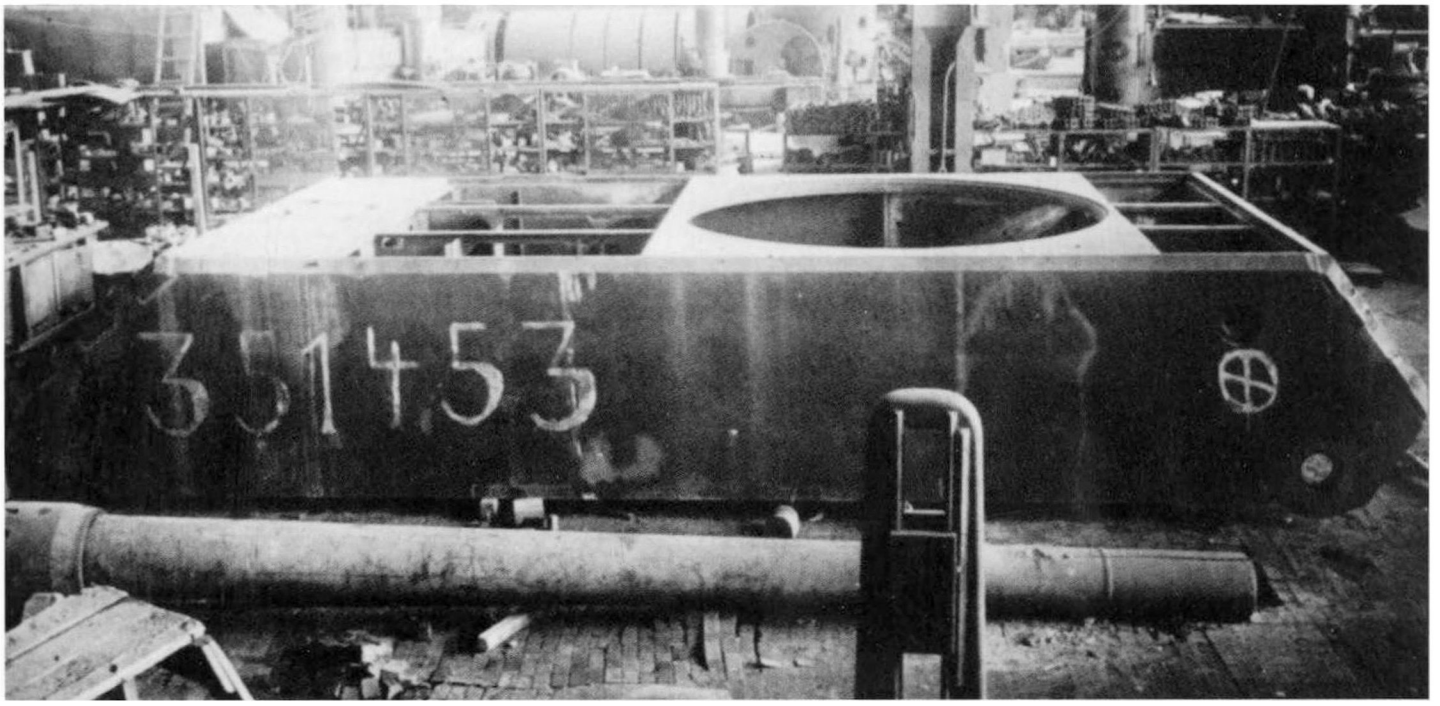
Evaluation of available photographs permits the conclusion that explosives with time delay fuses were placed in two positions in the interior of the vehicle:

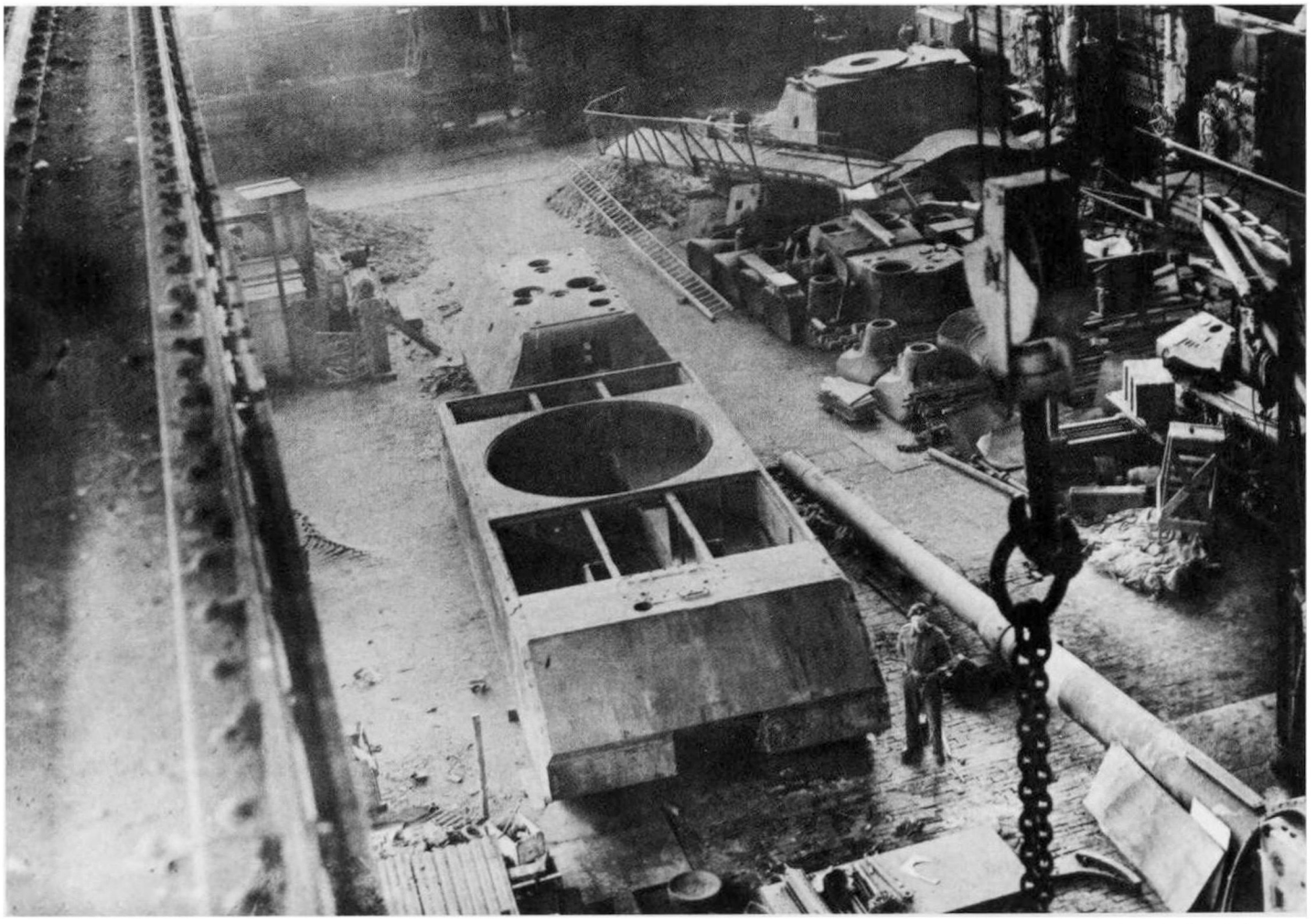
A. In the engine compartment from the driver's compartment. This resulted in a fire that melted the forward part of the 12-cylinder diesel's aluminum cover. Destruction of the vehicle structure or the armored shell was not achieved.

B. In the fighting compartment.

Detonation of the explosives ignited the 45 propellant charges for the 128 mm ammunition and the 75 propellant charges for the 75 mm ammunition stored under the turret. The 128 mm hollow-charge ammunition stored in the center and left side of the vehicle subsequently detonated, followed by the 128 mm high-explosive shells stored in the right side of the vehicle. The pressure effect of the 128 mm armor-piercing shells housed in the left side of the vehicle may have been less because of their low explosive content and thicker shell casings. The detonation of the ammunition took place at increasingly short intervals. Initially the hatches, periscopes, and maintenance hatches were blown open or torn off and cast aside. The same was true of the engine compartment covers, whose parts fell several meters from the body of the tank. On the right side, the 180 mm [7.09 in.] upper and 100 mm [3.94 in.] lower side armor plates were demolished. The 128 mm high-explosive shells stored there had the highest percentage of explosives and the greatest explosive force. The pressure of the explosive gases was so great that the rear bogie set was literally sheared off. The entire side armor was blown off, along with track links, road wheels , and parts of the road wheels mounts. The weld seams, which were made to withstand pressure from the outside, could not cope with the pressure that built up inside the vehicle. Sections of the turret ring were broken off, and flying shell fragments and pieces knocked from armored components left their mark on the breech of the 128 mm gun and the turret interior. The 128 mm ammunition stored in the back of the turret may have detonated at this time. This increased the force, and the turret was thrown from its seat, fell back onto the armored shell, and slid against the already dislodged side armor, with its front facing two o'clock. The fuel in the tanks in the forward part of the vehicle—in compartments separated by bulkheads—was not ignited, but the tanks were perforated by splinters.

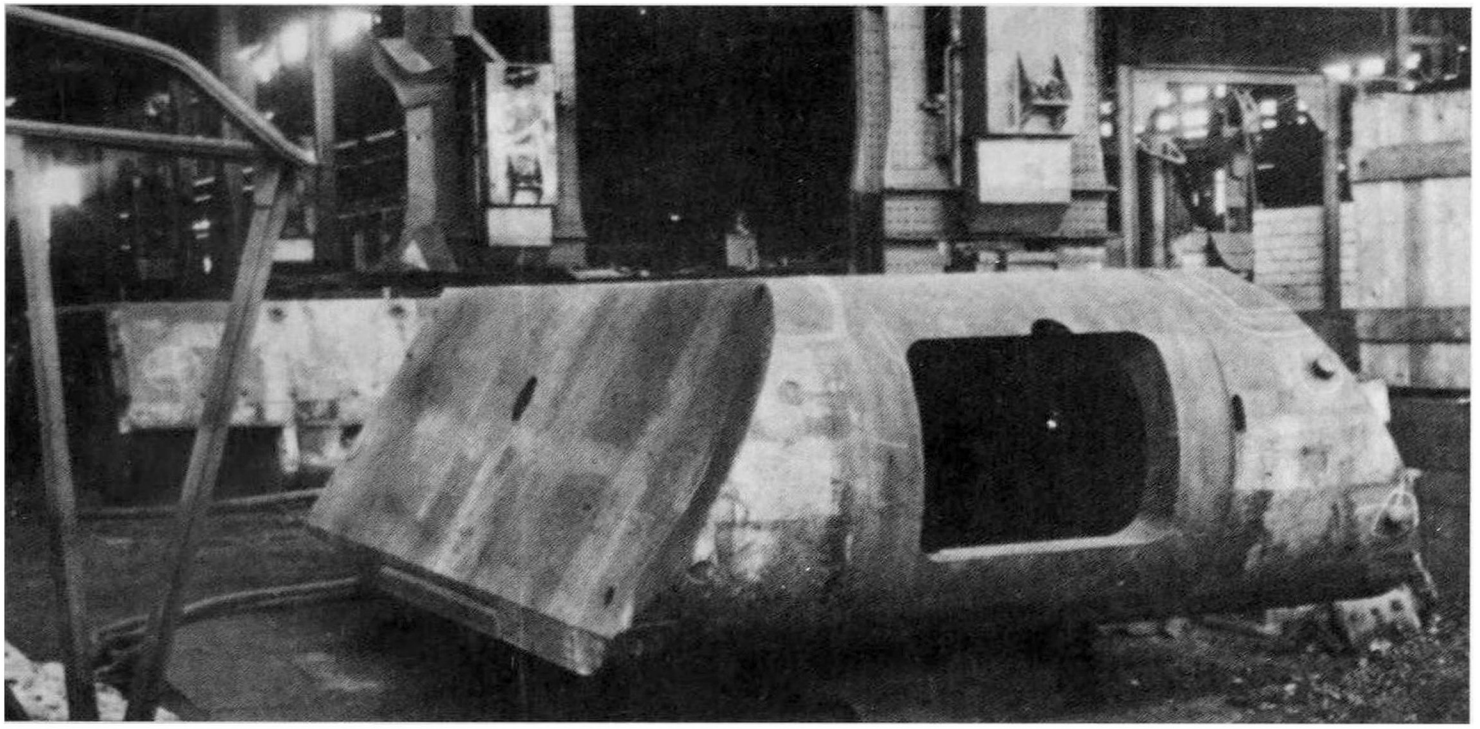
Maus 205/3-7 – The Uncompleted Ones

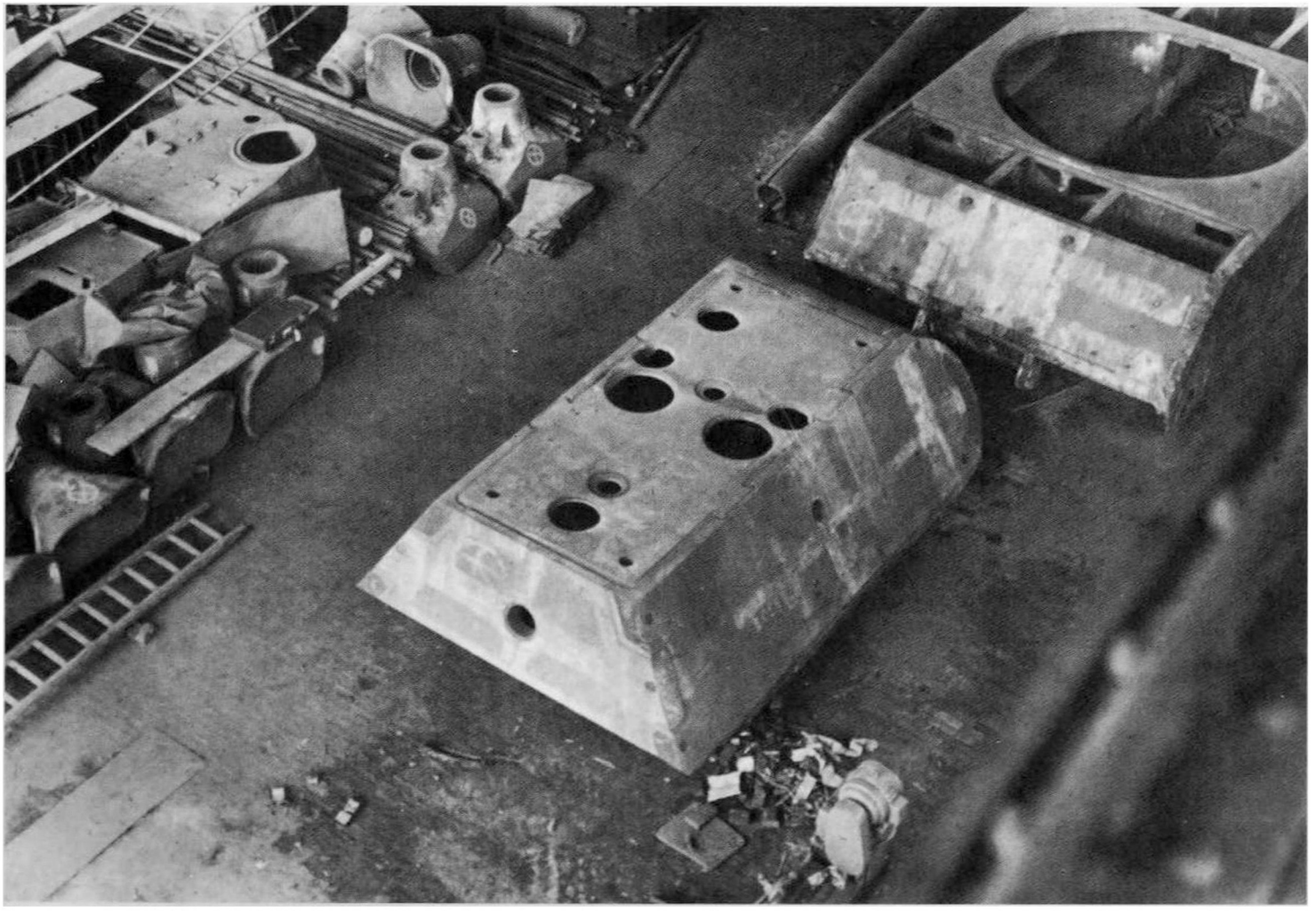




Seen here in the Krupp factory in Essen after it was occupied by the Allies is, first of all, hull Number 3 (351 453) in the wagon workshop. It already has the driver's hatch and all the welding has been done. It was considered fully fabricated and was to be stored at the factory until further assembly. Behind it is turret Number 2—also virtually complete—and above, in addition to Jagdtiger Saukopf mantlets, can be seen two double gun mantlets from the Gruson factory in Magdeburg. The third gun mantlet had already been installed in prototype turret 1 on Maus 205/2.

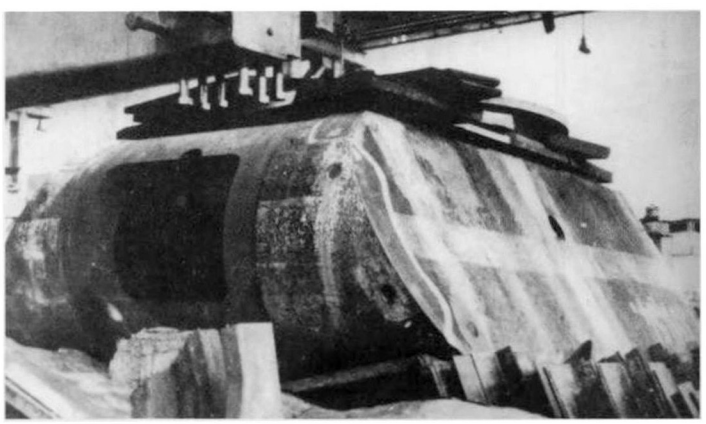
Production of the Maus was halted by order of the Armaments Ministry on October 27, 1943. The remaining armor plates were to be used in the "assault gun program" and the rest was supposed to be scrapped. An idea of the number of remaining manufactured components can be gathered from photos taken in 1945. Three Maus hulls and three turrets





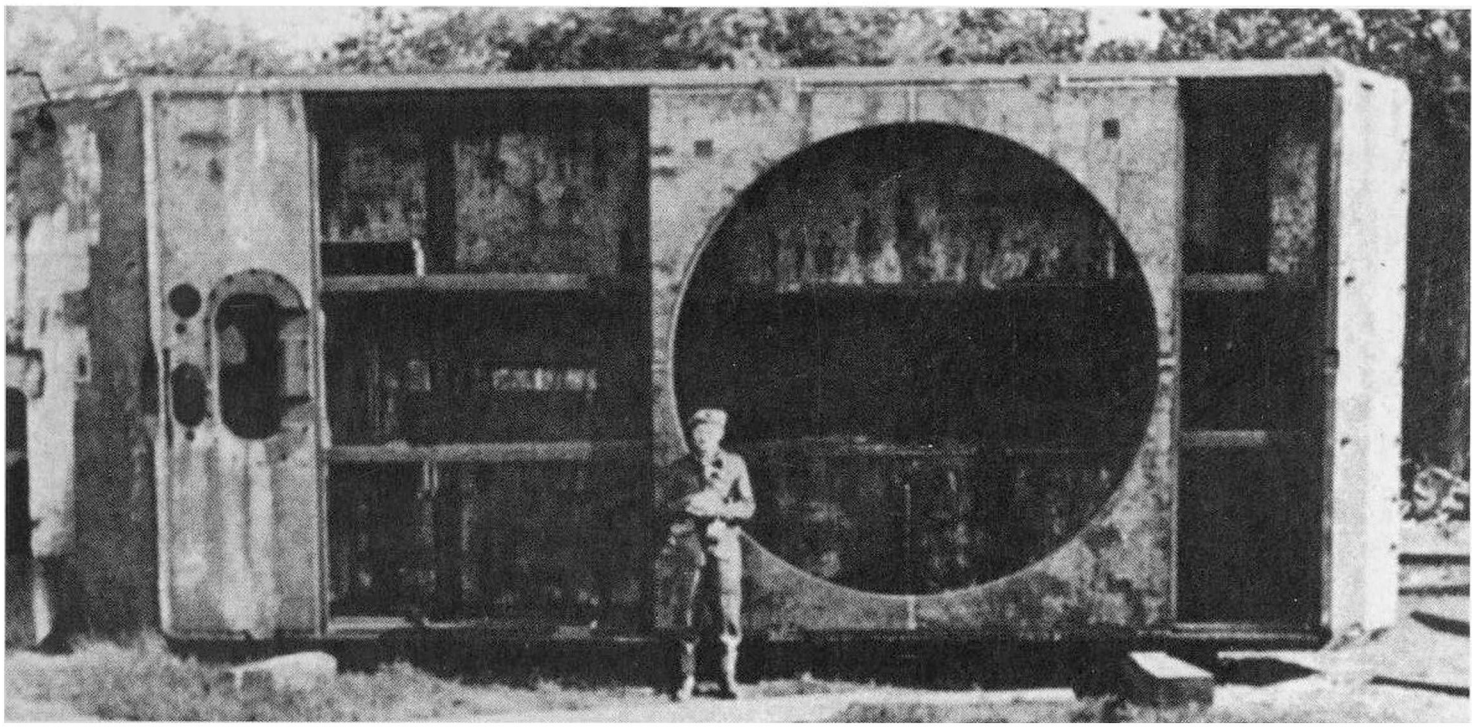
The incomplete shear bolts (marked with chalk) are clearly visible on turret Number 2. As it had been machined more than once and only three turrets were stored in the factory, it stands to reason it was taken from the stockpile.

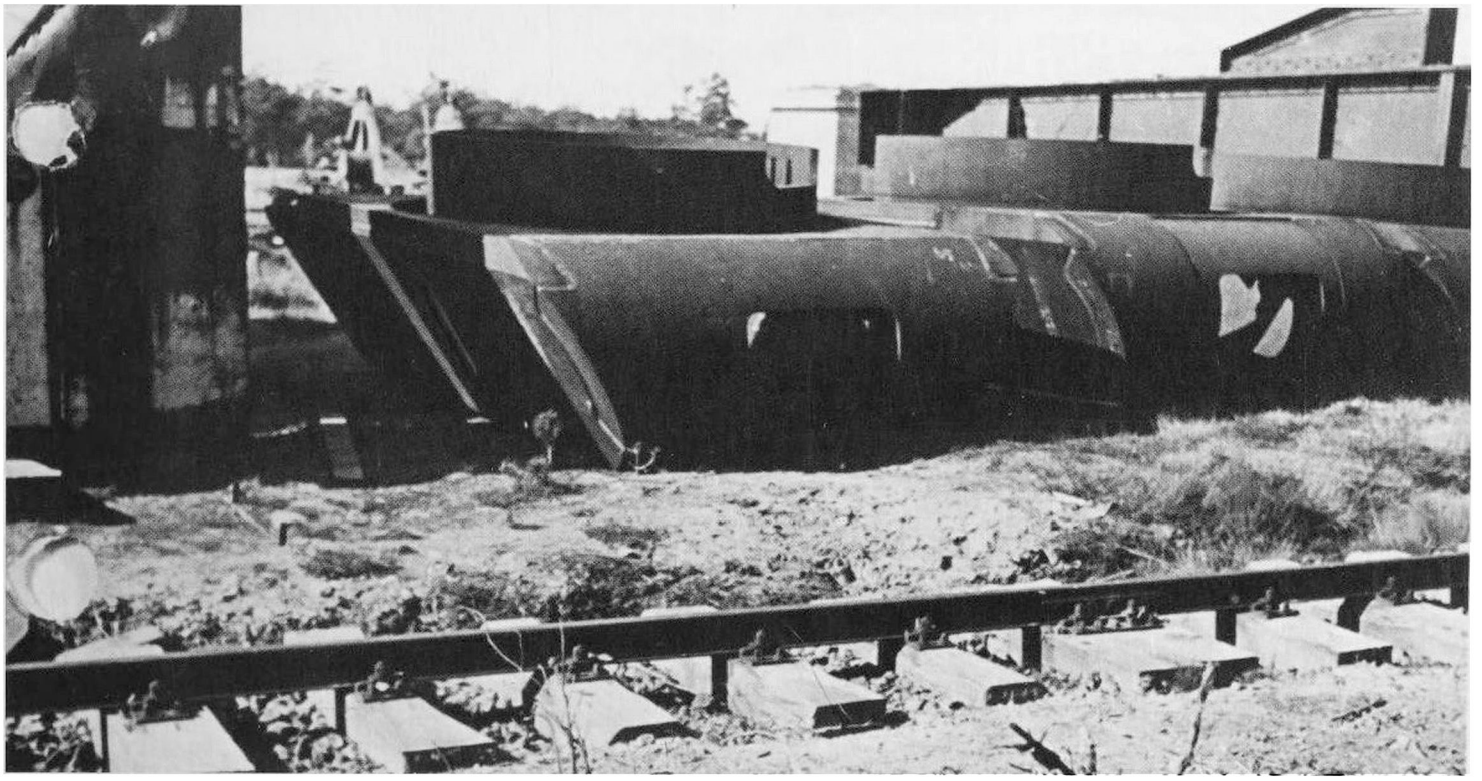
In addition to parts of Tiger tanks, there was also another Maus hull in the factory hall—theoretically hull Number 4. Above that are two turrets (Turrets 2 and 3). Turret 2 (with the chalk marks around the shear bolts) was later moved next to Hull 3 so it could be photographed better. The turrets have received the milled machine gun opening, the shear bolts are mounted, and the rotating turret ring has been machined.



Here another turret and armor plates. This turret (4) had not yet received a machine gun cutout, but has shear bolts between the bow and side plates.

were discarded near connecting track 3500 (the "Forest Position") at Krupp's firing range in Meppen. The next photos I wanted to show were taken at the firing range in Meppen by Polish troops in 1945. Unfortunately, I was unable to obtain permission to print them from the owners, the Sikorski Museum in London. I would nevertheless like to briefly describe them: the good quality photographs show three hulls, probably numbers 5, 6, and 7. Welding appears complete on 5 and 6, but they have not yet been machined. The numbers painted on the hulls (192 W4 and 192 W6) suggest that the hulls were in fact numbers 4 and 6, but according to Krupp, hull 4



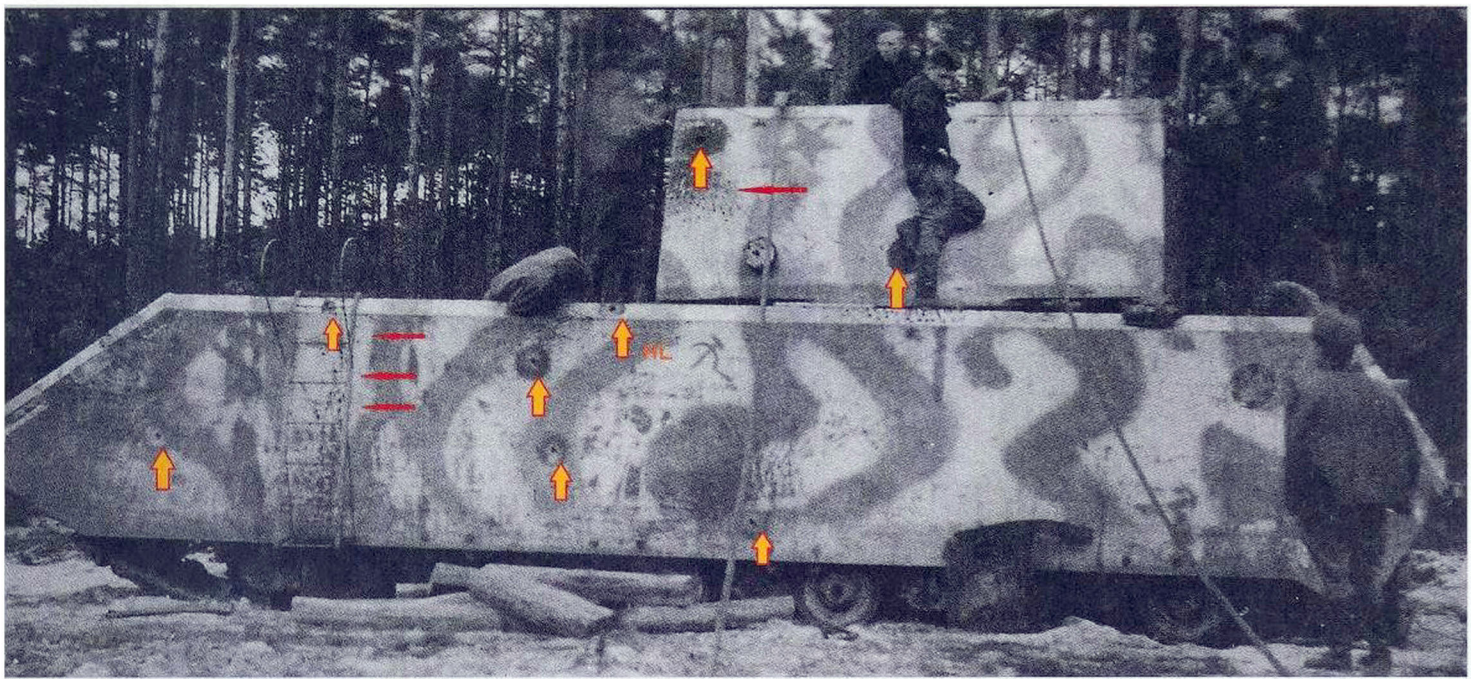


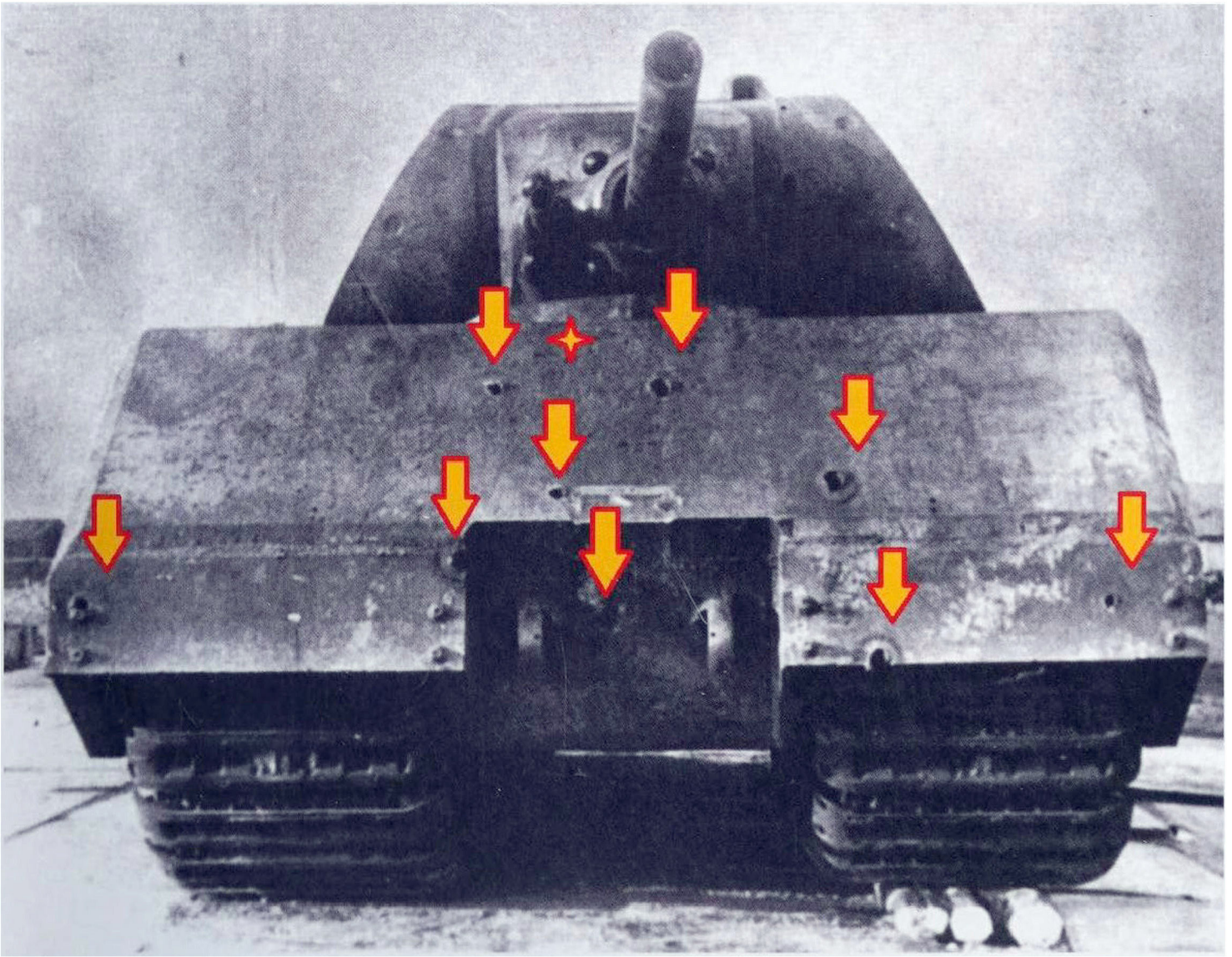
British soldiers inspect the three hulls and turrets.

was almost complete. The hull in the rear (hull 7) was a production hull and had armor plating of reduced thickness. It can be seen that much of the welding work remained to be done. The shear bolts are also missing, but the cutout for the driver's periscope has been milled; this was done to improve the driver's field of view from the vehicle. There are also shells of three turrets (probably) numbered 5, 6, and 7. The turrets were not fitted with turret rings and the machine gun openings are also missing. The ammunition and close defense openings are visible in the rear. The forward cutout in the support ring provided better access to the auxiliary power unit in the right side of the hull. Krupp had in storage materials for five more Mäuse (four prototypes and one production vehicle). The parts for Maus 205/4 to 205/7 were supposedly later scrapped; only the parts for Maus 205/3 were retained for subsequent use. Apart from the components used on the firing range, only six hulls and turrets were paid for. The weight of a turret shell was just under 40 tons, while a hull shell weighed approximately 55 tons.

Maus 205/1+2 – The Russian One

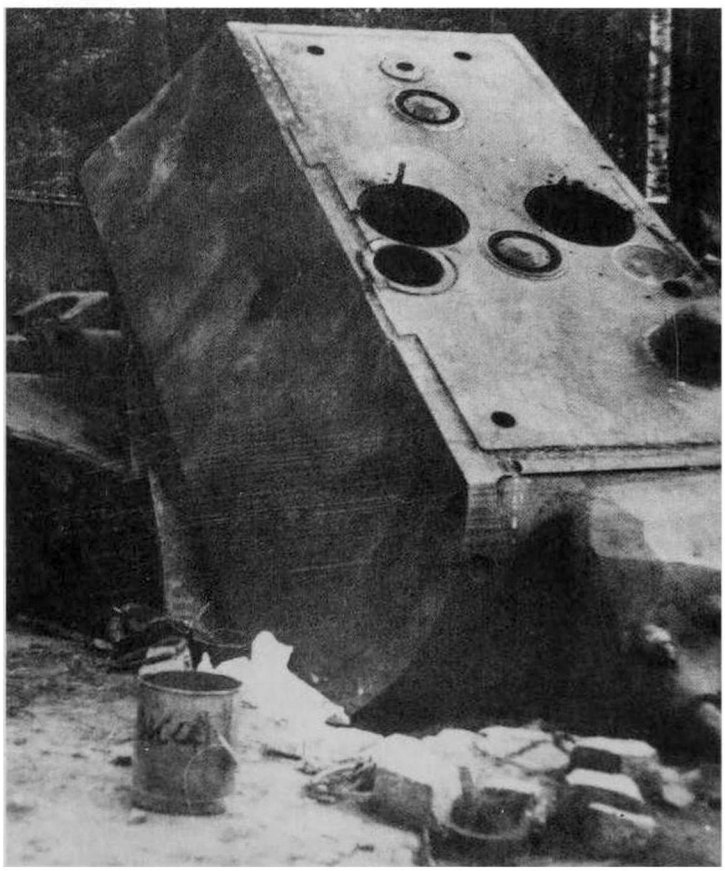
It was 1946. The war was over. The victors began inspecting the captured war materiel. The two wrecked Mäuse had been sitting in the open for a year and others had been stripped for souvenirs. By order of the Soviet Ministry for Transport and Mechanical Engineering, the two wrecked Mäuse were to be used to assemble one complete Maus and subsequently sent to the NIBT testing grounds at Kubinka, near Moscow. Winter was just about over and most of the snow had melted. As there was only snow on the ground from late February to mid-March in 1946, the period during which the assembly work took place can be dated from late March to early April. Maus 205/1 was in the open near Range West at Kummersdorf. In comparison to Maus 205/2, it had sustained relatively little damage. The left ventilation screen of the electric motor had burst, the left brake disc brake bearer had been blown out, the left track was seriously elongated, and a large track sack had formed the last time it was driven in reverse. The many shell marks in the glacis and left side hull armor and the turret weight were striking. In front, the tank had been struck by nine 76.2 mm shells. Four of the scars were probably made by hollow charges (identifiable from annealed and subsequently rusted rings around the impact point). The diameter of the individual impacts was approximately 5.5 centimeters [2.17 in.]. Why the Soviet troops fired at the tank with relatively small caliber ammunition remains a mystery. Perhaps it was only target practice to test the armor. Meanwhile, Soviet technicians busied themselves with Maus 205/2, which was required as a source of spare parts for Maus 205/1. The tank was in wretched condition. The right side armor plate had literally been ejected, the cover plate with the turret ring had slid to the side, and the running gear on the right side was partially wrecked. At least externally the turret was still intact.





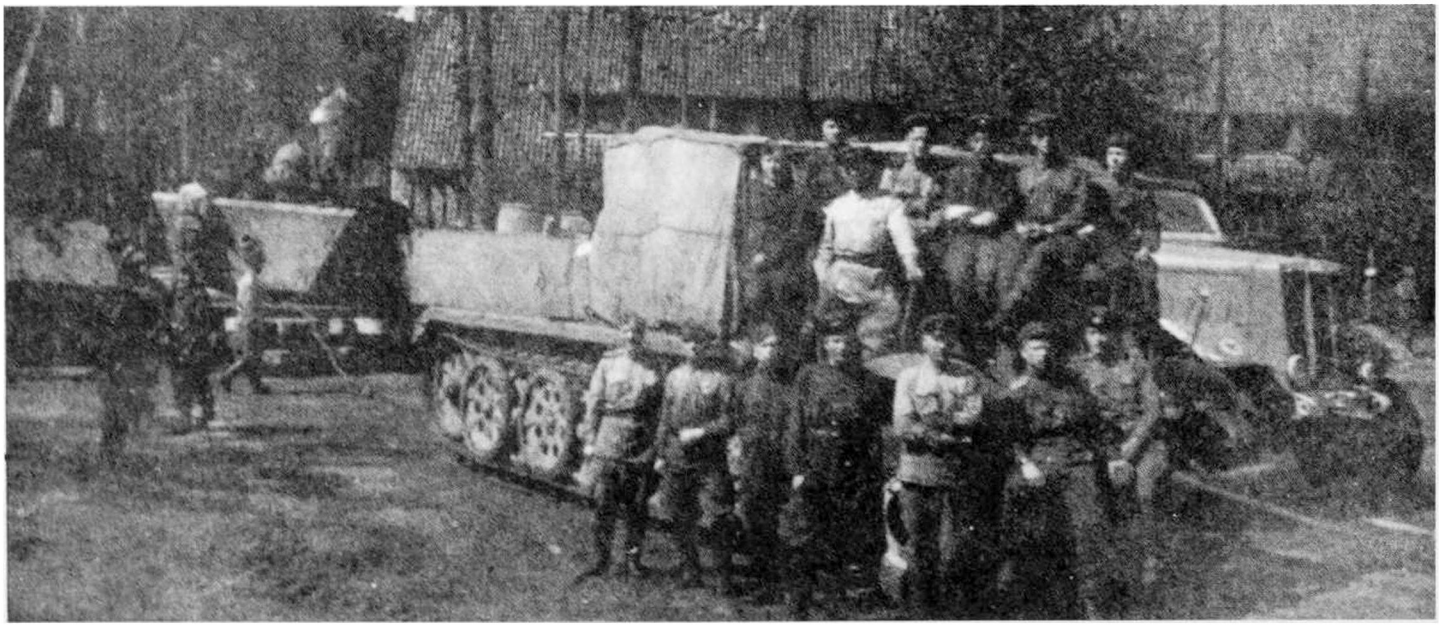
In addition to the seven impact marks, of which three were inflicted by hollow-charge shells, the side armor also has various marks caused by machine gun bullets (SMK) at the height of the ladder. Four shell impact marks and marks left by machine gun bullets can also be seen on the turret weight. One shell shot away a lifting lug (similar to a bollard). These bullet holes in the turret weight give reason to believe it was a cast weight—solid material, and not, as otherwise usual, a concrete weight covered with sheet steel. The lifting lugs would not have found support in concrete.

Together with the right engine grille (with reflector), the right radiator grille was blown off to the left, probably caused by the explosive charge on the front right of the engine. The turret, along with the top panel, slid off to the right. The turret hatches and the loader's revolving periscope were torn off.

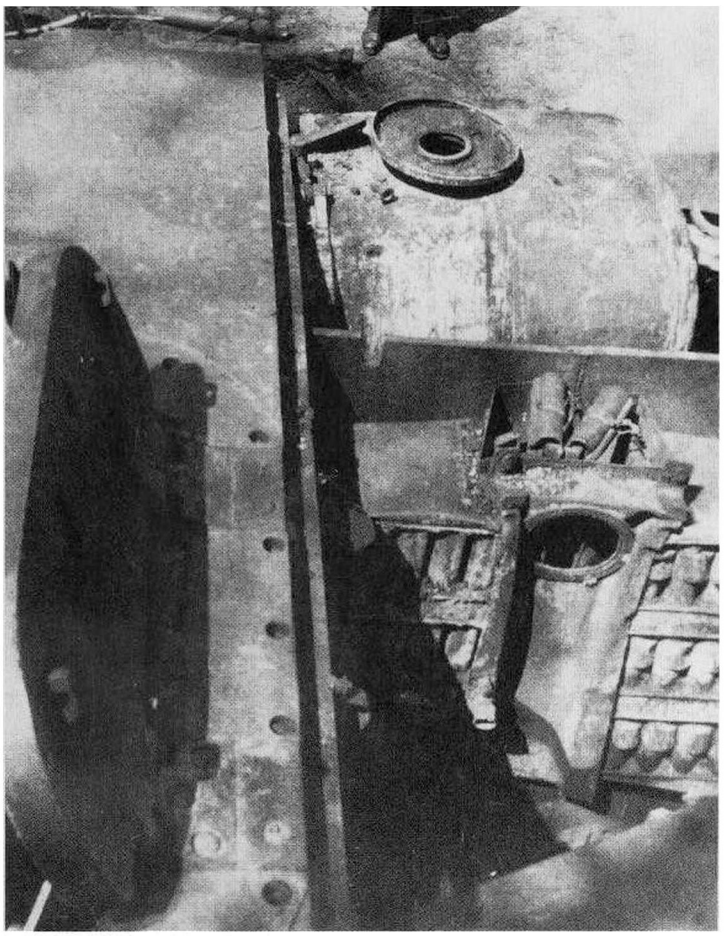


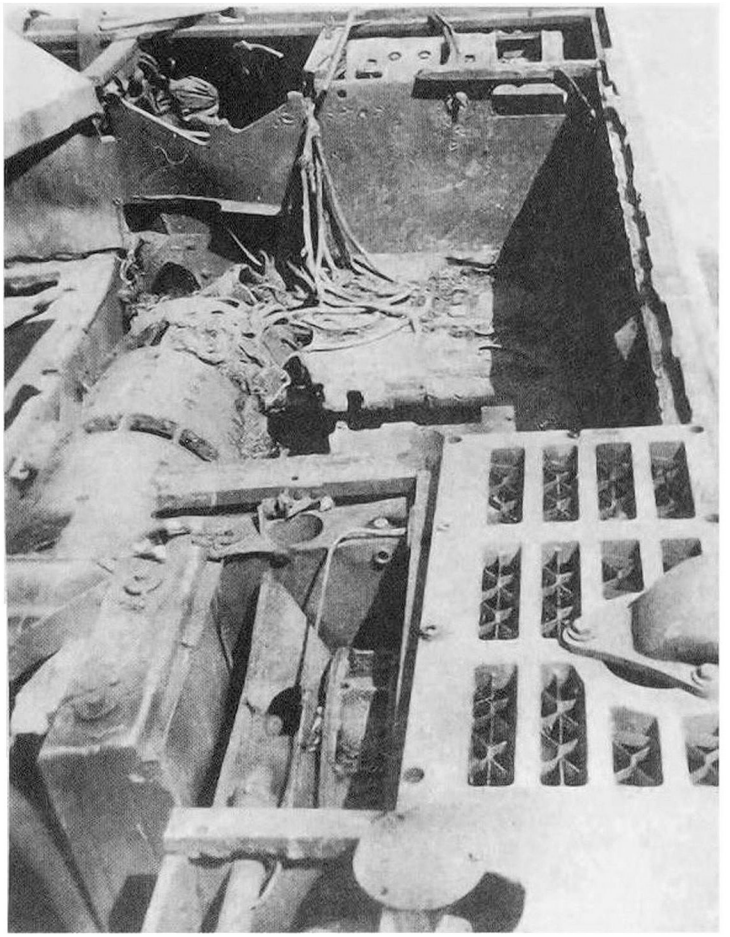
Six German FAMO 18-ton prime movers roughly tipped over the turret onto a stack of railroad ties, from there to be loaded onto a flatcar. The procedure had to be halted and started again several times to achieve maximum leverage.

It had been tipped off and now lay upside down on the railroad ties. The 128 mm gun had bored itself deep into the earth and the battered bearing must have sustained further damage.

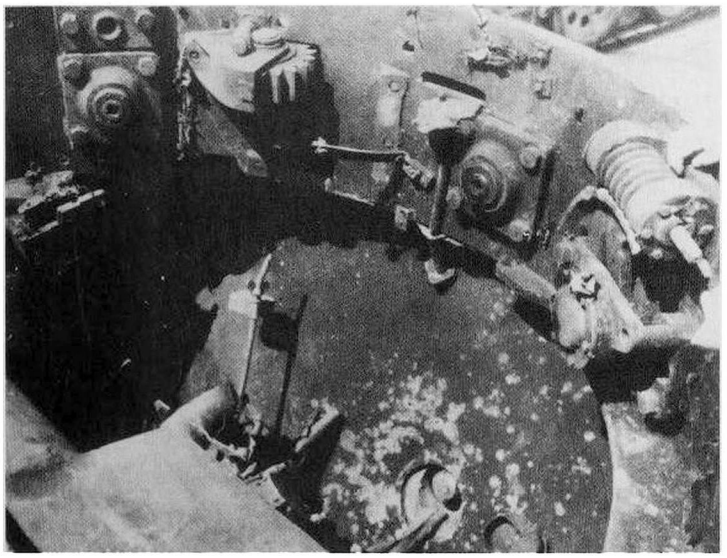


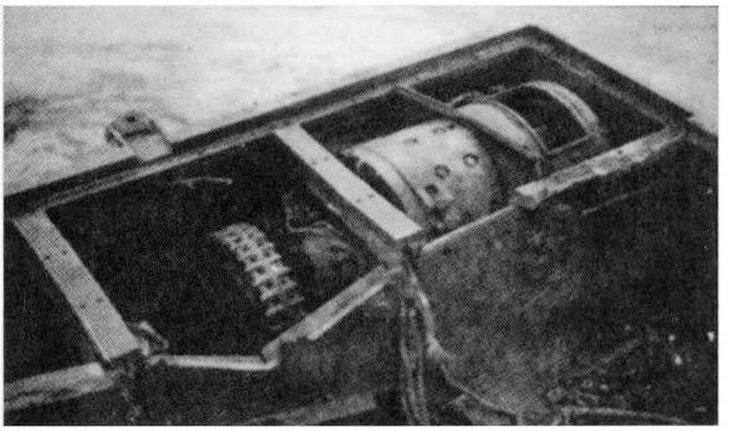
In the background is the turret lying on the pile of wood.

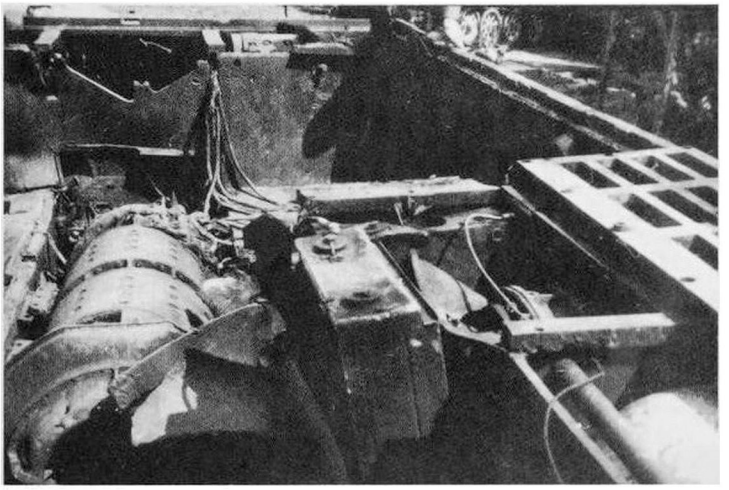




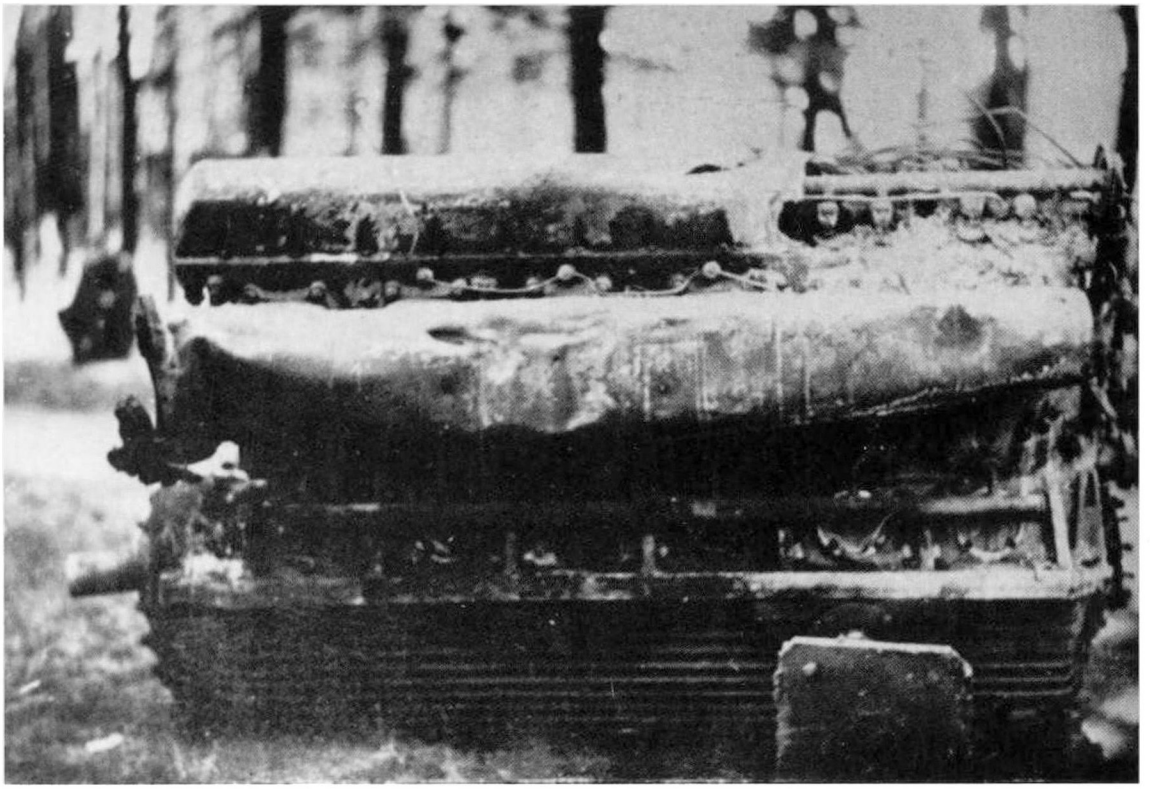
The driver's hatch (left) survived and was later fitted to Maus 205/1. Behind it is the diesel engine's air filter box, above the right-side fuel tank. The radiator with fan can be seen in the foreground in the photo on the right, and further aft the double generator. The cables lead to the electric motor where a soldier is working on the brake, which was subsequently used for Maus 205/1.



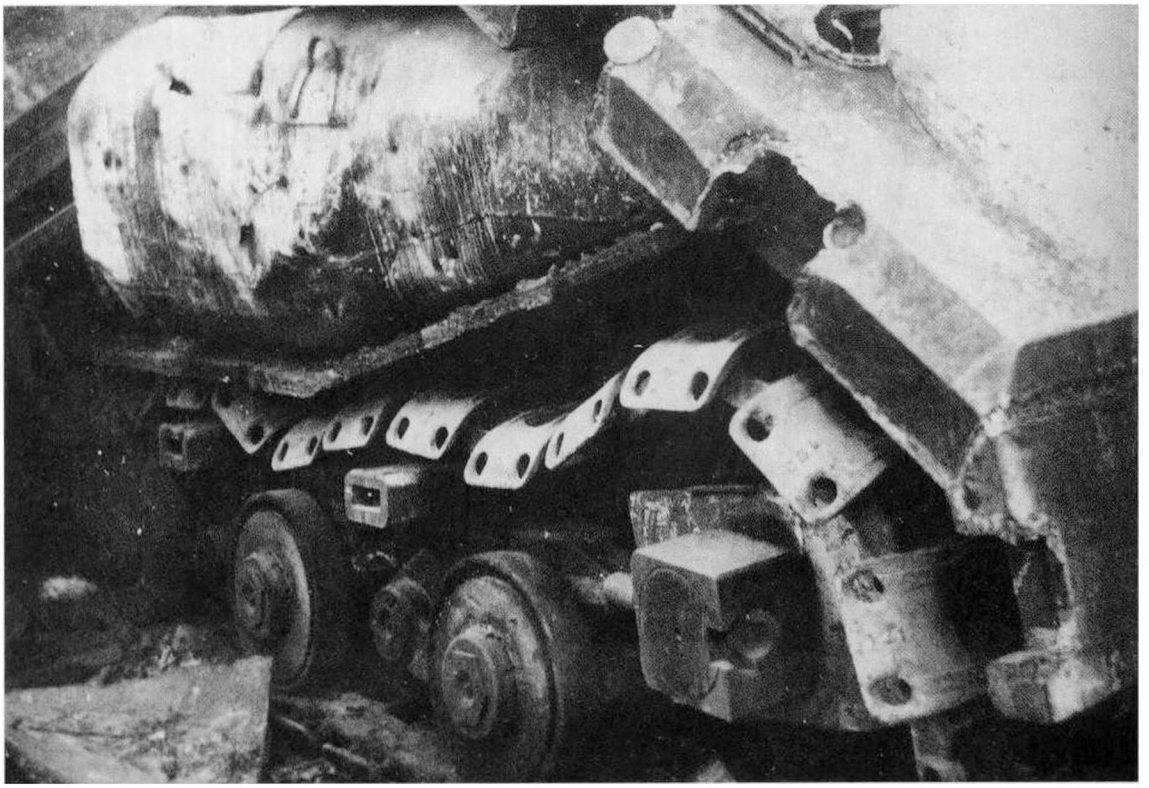




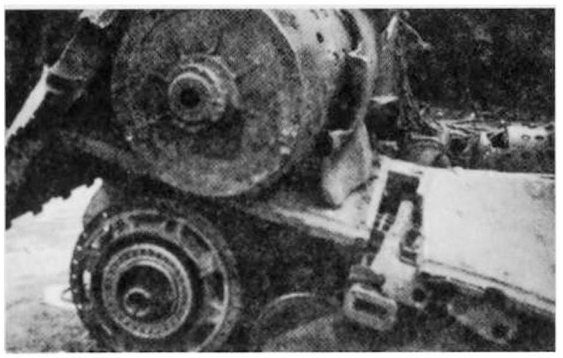
The tipped-over turret lying on its roof. The devastation inside the turret can clearly be seen. The mechanical and electric traversing gear, the commander's 12 o'clock indicator, and part of the turret raising system have been torn away. There are fragment marks all around the submachine gun port. Below left is the base of the 128 mm KwK 44's breech mechanism. The turret was loaded from the pile of railroad ties on to a flatcar and taken to Kummersdorf-Gut.



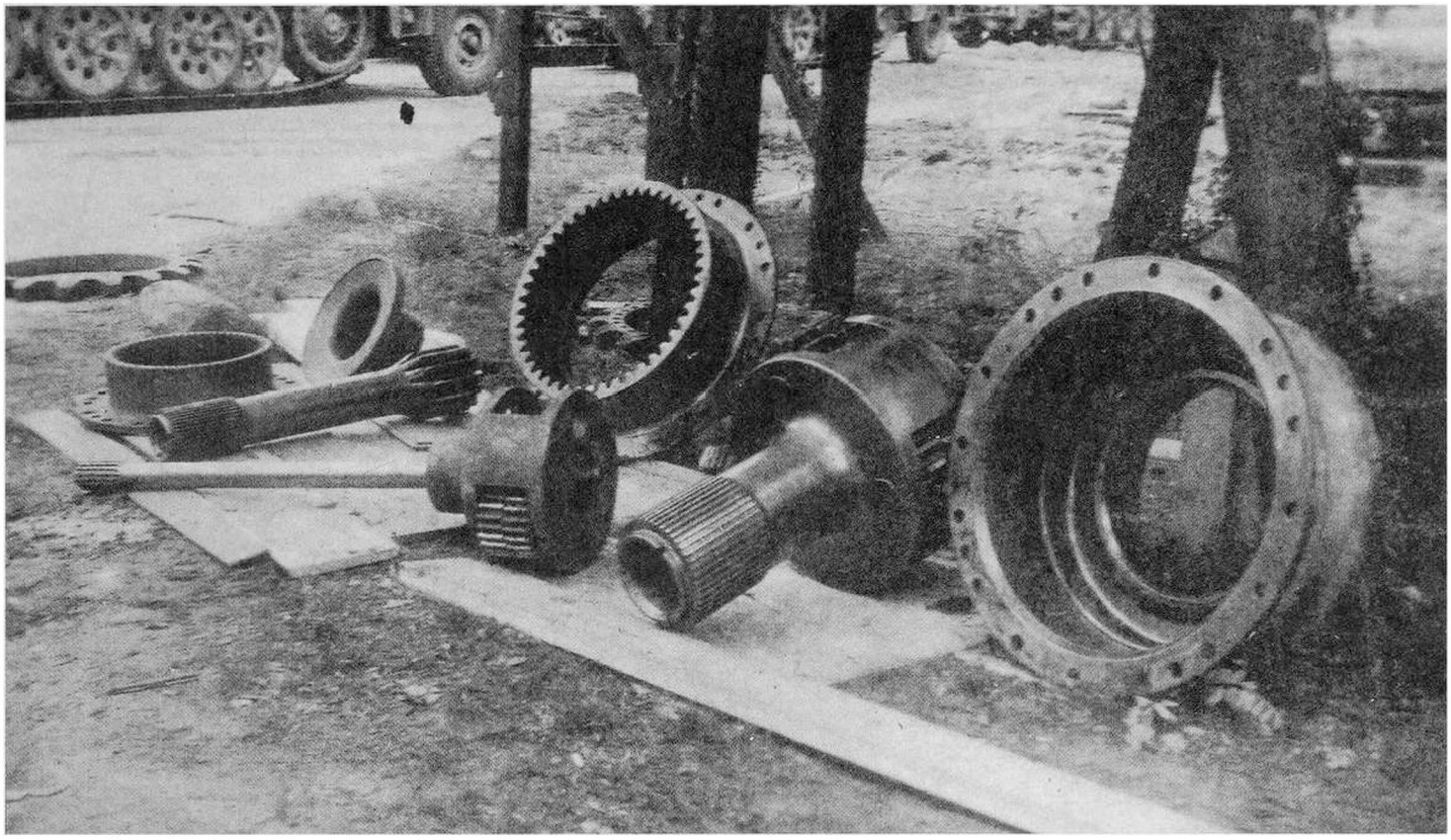
The wrecked engine lies to one side. The aluminum valve cover has melted away, the exhaust manifold is dented, and the forward ancillary equipment, such as the alternators and the Riedel starter engine, have been torn off. All that remains are the mounting studs. The engine mounting has been completely torn away. The Bosch injection pump's diesel lines are hanging chaotically, suggesting additional damage to the engine. The engine is nothing more than scrap.



Here is an interesting view of the rectangular and round interlocking joints of the side armor plate. The track tightening mechanism with the opening for the spindle (still in the torn-away plate) can be seen below. The right-side diesel fuel tank is badly perforated, although there was no fire. The tanks had probably run dry and was the reason why the tank was destroyed by its crew. It is interesting that the new-style road wheels (with perforations)—as seen in the first photos taken at Böblingen—have been replaced with the old version without holes. The track links (with and without cleats) were also mixed.



The right-side electric motor below the remains of the reduction gear. Above right is the auxiliary power unit.



Parts of the right planetary drive. In the background are the six prime movers. The planetary gears, axles, and the quick-release axle and drive sprocket are all clearly visible.

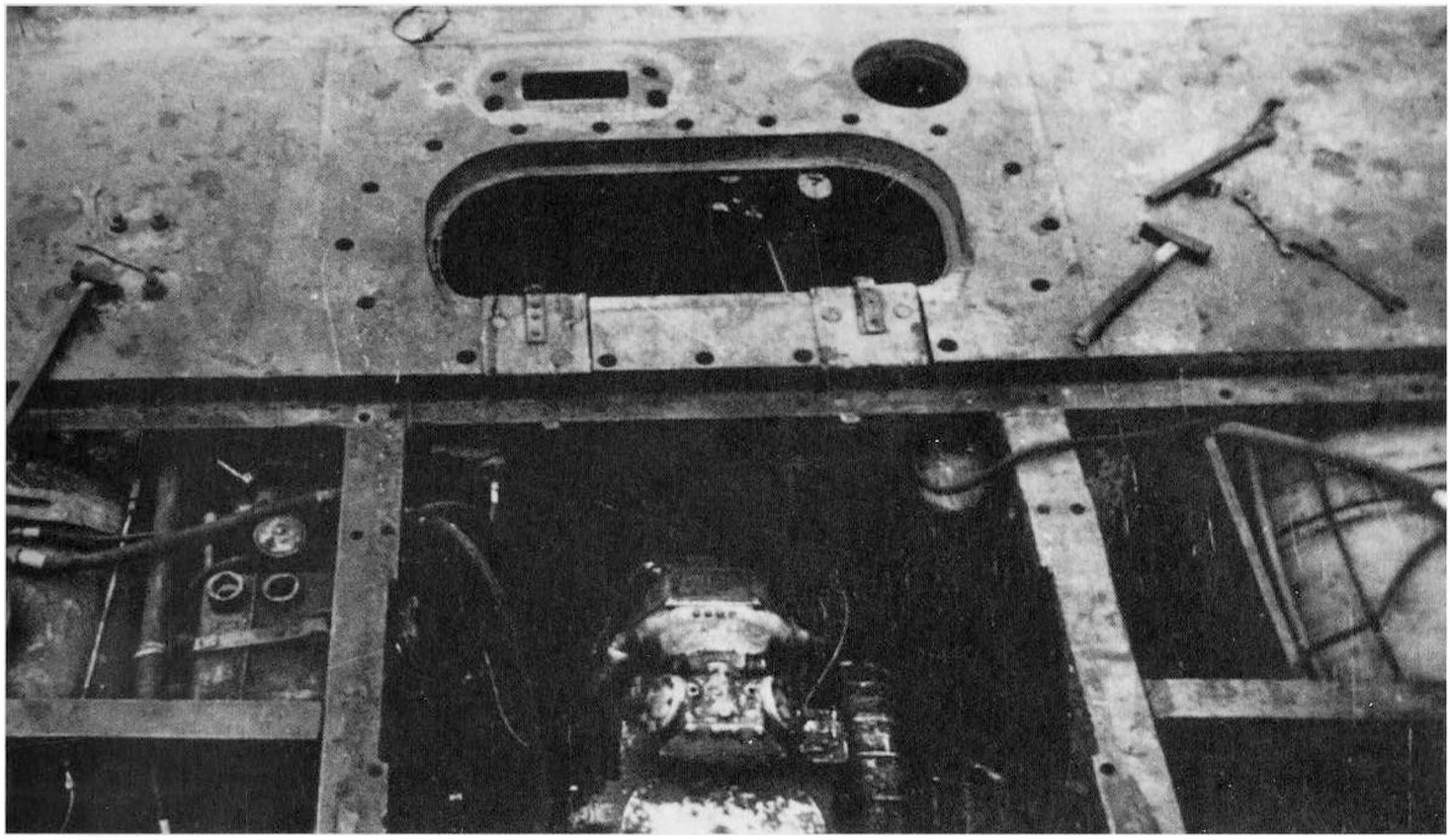
Parts of the right planetary drive.

Assembly and Removal of Maus 205/1+2

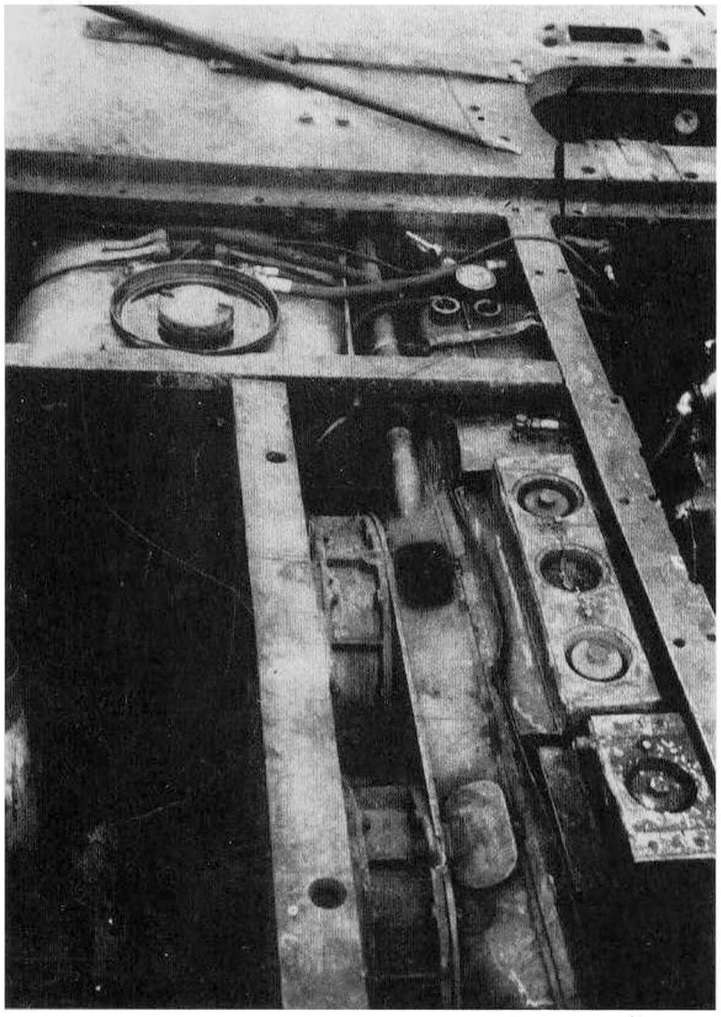
Meanwhile, Soviet technicians continued work on Maus 205/1. All salvageable parts were removed from Maus 205/2 to assemble a complete tank on the basis of the hull of 205/1. As the vehicle was too heavy to tow work had to be carried out on the spot. Most likely an original DB 603 A aircraft engine was installed. There were plenty of these power plants about. This would explain the power figure of 1,375 hp in the report from Kubinka described later. At the end of April, the repaired Maus 205/1 rolled across the firing range to Kummersdorf-Gut. There, in the former VersKraft-Neu, was the turret from Maus 205/2 that was ultimately mounted on Maus 205/1. The resulting Maus 1+2 was driven onto the waiting 14-axle heavy load wagon from the loading ramp in front of the main entrance to the firing range at Kummersdorf.

First to be removed was the 55-ton cast iron turret weight, because work space was needed. Steel cables were attached to the edge of the turret weight simulator so an 18-ton prime mover could pull it off. The sagging left track and the shot-away "bollard" on the turret weight are clearly visible.

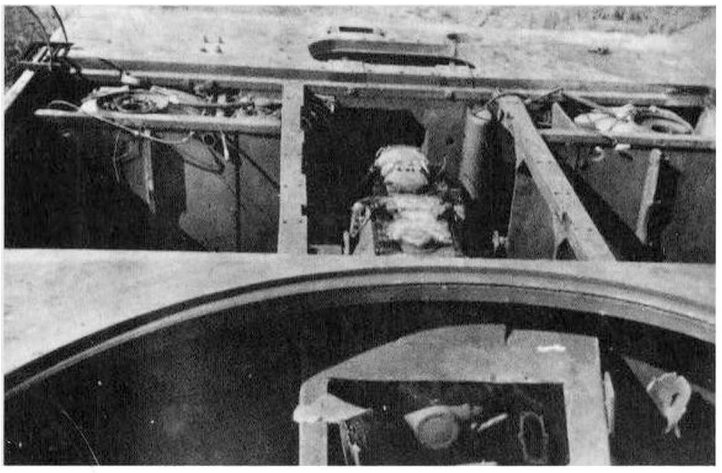
The turret weight is gone and it appears the MB 509 engine is being removed, suggesting a defect. Externally the only visible damage is near the left-side electric motor. Perhaps the German crew also tampered with the tank's 12-cylinder gasoline engine before abandoning the vehicle.



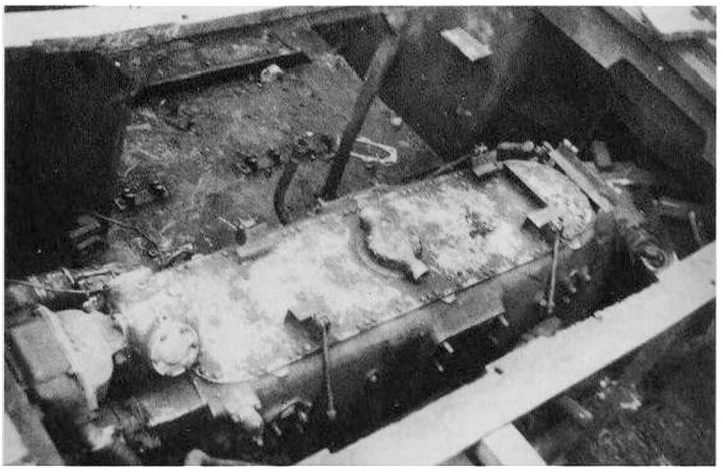
The radiator is also missing. Space was created for the removal of the engine mountings. With the (wooden) driver's hatch removed, the instruments can be seen in the driver's position. On the left, the small tanks next to the left gasoline tank were filled with gasoline for the two-stroke Riedel starter engine and engine oil for the 12-cylinder MB 509.



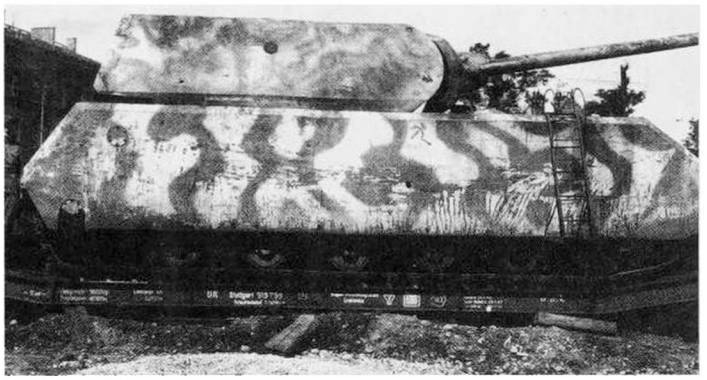
All of the cover plates have been removed, and the shutters, air baffles, and air filter boxes on the engine are already gone.



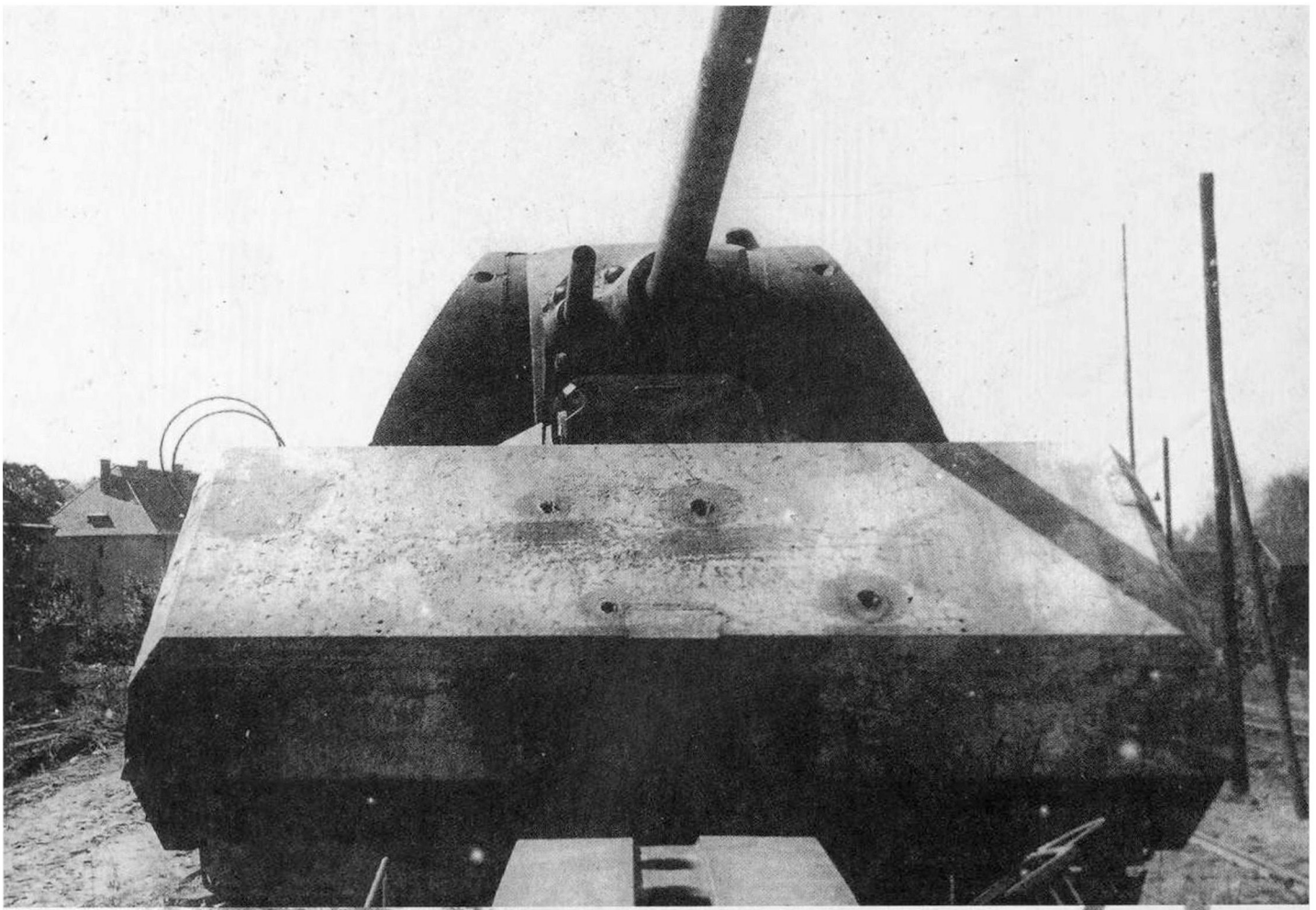
View from the turret ring cutout toward the exposed MB 509 gasoline engine.



The engine from above. On the left, atop the engine, is the ignition magneto and in the middle the engine ventilation. The engine was now ready for removal.

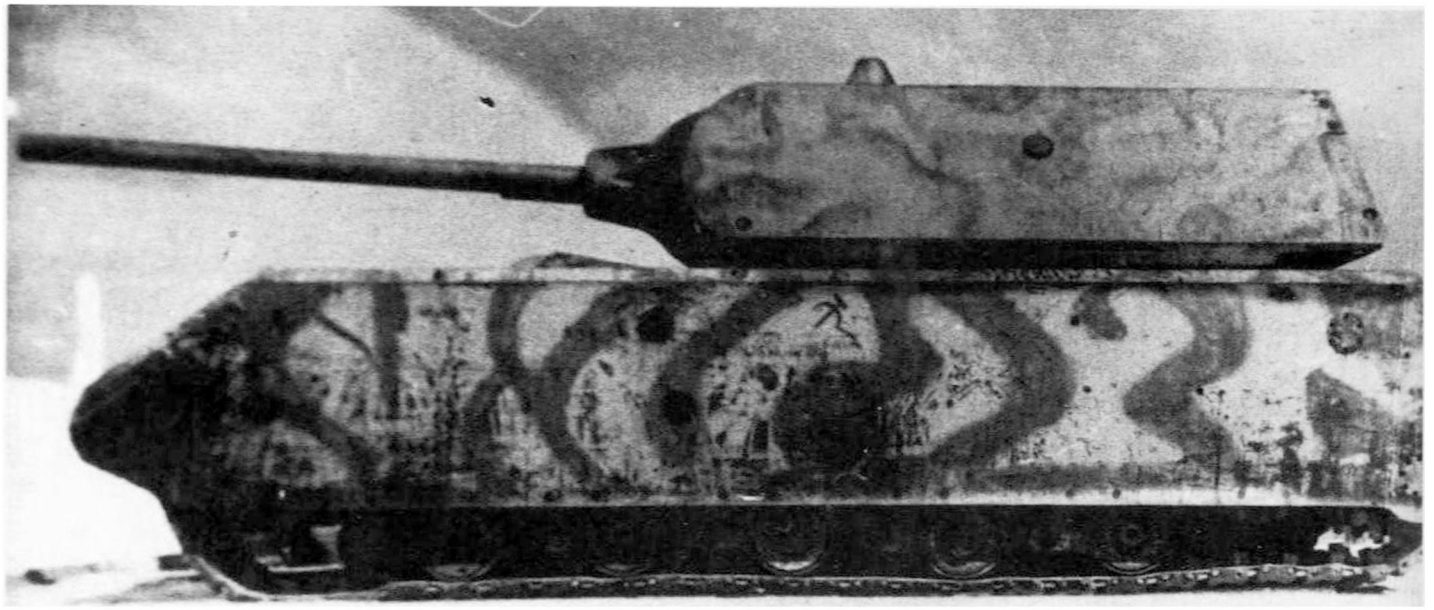


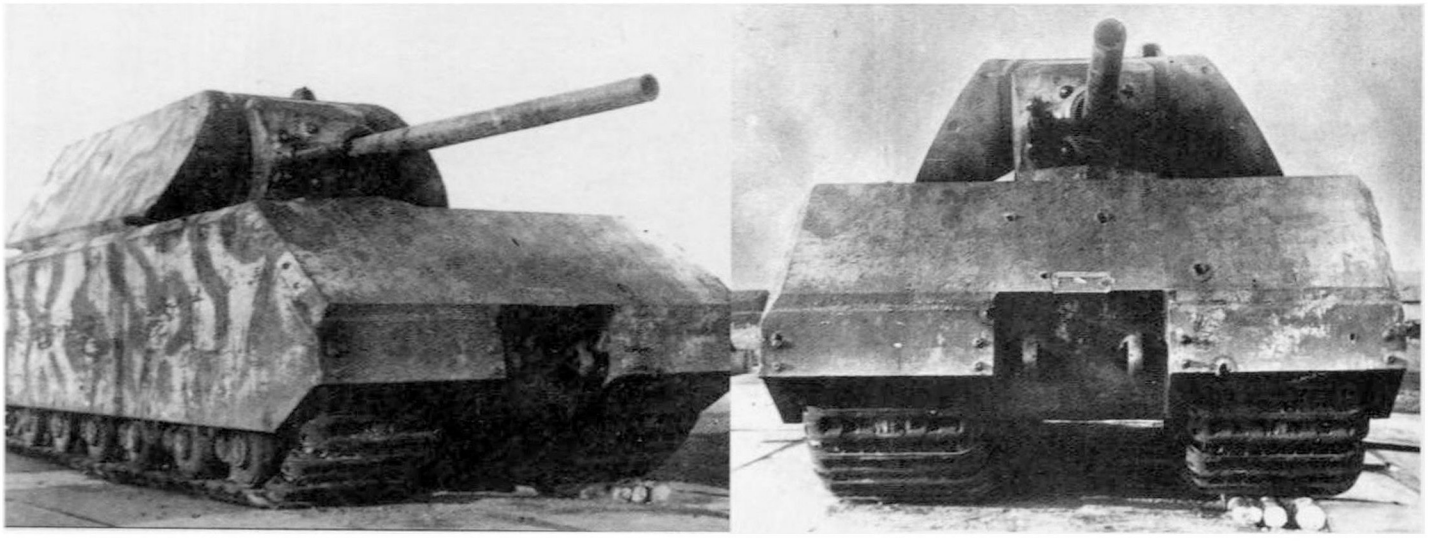
In the background is the barracks of the Kummersdorf-Gut firing range. Note the different camouflage schemes on the hull and turret.



The Maus loaded and ready for the long trip to Moscow.

Because of the tank's great weight, transport to the testing grounds near Moscow would have been long and difficult. At the Soviet border the 27-meter-long [88.6 ft.] special heavy load wagon weighing 70 tons would also have had to have been re-gauged from 1.435 standard gauge to 1.524 Russian gauge. The fact wagon Stuttgart 918 799 was still being used by the state railway in 1953 remains a mystery. The transport arrived at НИБТ (NIBT – Institute for Military Technology, Institute for Research and Development) proving grounds at Kubinka on May 4, 1946, approximately 60 kilometers [37.3 miles] from Moscow.





Extra rods were placed under the left, sagging track for these photos. The reason: one complete pair of road wheels was missing from the left rear bogie set. The entire left rear end of the hull sagged. There are different finishes on the hull and turret. The impact marks from the hollow charge rounds have rusted and can be seen clearly.

NIBT Proving Grounds Report ("Adventures of the Maus in the USSR," *Panzer* magazine)

The Maus underwent extensive testing at the proving grounds, continuing until 1951. Evaluation by Soviet technicians must be assessed rather more critically, as the vehicle as Maus 205/1 was never complete and Maus 205/2, including turret, was so destroyed that many details were lost. The Soviet specialists were also unable to find any drawings or documents, as described in the following report. The—unfortunately undated—report on the Maus is so interesting that appropriate parts of it are reproduced here. I would like to concentrate on reproduction of the significant, but also the contradictory. My comments follow in brackets. The report provides a description and overview of the super-heavy Maus tank. The destructive effects of the blasts in the two examples of the Maus tank resulted in the total destruction of some mechanisms and equipment. As no drawings or documents were available, it was impossible to provide a description of the destroyed components. That notwithstanding, the report could have been of significant help to the indigenous tank industry in view of the study and experience it provided in the design of super-heavy tanks.

1. Specifications and Structure of the Tank [omitted due to its length]

2. Historical Course of Events: in 1942, Porsche received the following primary data for the contract: weight 160 tons, maximum speed 15 kph [9.3 mph], and two turrets.
a. Forward turret 150 mm gun
b. Rear turret 128 mm gun [not two turrets on one tank, rather two variants]. The tank was planned by Professor Porsche of Stuttgart. The parts and power units were manufactured by the following companies:

- manufacture of the hull and turret with equipment by Krupp of Essen.
- Running gear and power transfer came from Skoda in Pilsen, Czechoslovakia.
- The gasoline engine was provided by Daimler-Benz of Stuttgart.
- The engine cooling fan system came from a company in Friedrichshafen.
- The water, exhaust, and oil coolers came from Behr of Stuttgart.
- The filtration system was provided by MANN and Hummel of Ludwigsburg.
- General assembly of the tank (without turret) was carried out by Alkett of Berlin, which had the necessary assembly and transport equipment.

All [systems and items] from the supplier until assembly of the tank were repeatedly tested to guarantee reliability after assembly. Alkett began work on the two tanks in February 1944, and completed it in late 1944 [either the period of testing was confused with that of manufacture or it refers to 205/2]. After a brief check-out on the company's testing grounds, the tanks were transported to the master company [verbatim] Porsche in Stuttgart on a specially designed platform wagon with a 180-ton payload. In Stuttgart, the master company Porsche completed assembly of the tank [fitting the turret onto the tank] and carried out subsequent operating trials under the leadership of Professor Porsche. In October, the tanks were ordered to the proving grounds in Kummersdorf, where further driving and artillery tests were carried out. The tests and follow-up work on the completed model were halted in late 1944, as by then the German tank industry was incapable of quantity production of this tank, not even the ten tanks per month requested by the general staff! After Germany's surrender the Germans blew up both completed examples of the tank. They were found in the Kummersdorf-Zossen area. By order of the BT and MW [Minister of Transport and Traffic?] one tank was assembled from the two wrecked tanks and sent to the NIBT proving grounds, where it arrived on May 4, 1946. The hull, turret, intermediate drive, electric motors, fuel and oil tanks, radiators/coolers, ventilators, and the driver's section of the tank are largely still present. The remaining systems, such as power units and equipment, are either entirely missing or have been rendered unusable.

I. General

1. Specification

Super-heavy tank, manufacturer Alkett-Berlin, year built 1944, combat weight 180 tons [actual weight 189 tons], power to weight ratio 9.6 hp/ton [because of the incorrect engine performance figures: actual at 1,200 hp = 6.34 hp/ton], ground pressure without sinking 6 kg/cm² [85 lbs/in², actually 1.45 kg/cm² [20.62 lbs/in²] at 189 tons and a track length of 5.86 meters [19.26 ft.] and track width of 0.65 meters [2.13 ft.], crew of 6.

2. Main Parameters

Length with gun forward [12 o'clock]: 10,000 mm [32.8 ft, actually 10,085 mm [33.1 ft.]]; with gun to the rear [6 o'clock]: 12,500 mm [41 ft, actually 12,659 mm [41.5 ft.]]; width: 3,710 mm [12.17 ft, actually 3,670 mm [12.04 ft.]]; height 3,700 mm [12.14 ft, actually 3,630 mm [11.91 ft.]]; track [middle]: 2,330 mm [7.64 ft.]; track length [with no sink] 5,860 mm [19.23 ft.]; track length [with 100 mm of sink]: 7,100 mm [23.29 ft.]; height of center of drive sprocket: 750 mm [2.46 ft.].

3. Armament

Two guns—128 and 75 mm—one 7.92 mm machine gun. An anti-aircraft cannon was envisaged for the project.
- 128mm KwK 44 gun, overall length: 7,050 mm [23.13 ft, actual 7,020 mm [23.03 ft.]] / caliber length L 55, barrel length: 5,660 mm [18.57 ft, actual length of the barrel section 5,533 mm [18.15 ft.]], charge spaces: 21.49 dm³ [actual 22.88 liters [6.04 gals]], the barrel had 40 riflings, width of a rifling: 3.5 mm [0.14 in, actual 4.0–0.6 mm [0.16–0.18 in.]], depth of a rifling: 1.5 mm [0.06 in, actual 1.7 mm [0.07 in.]], height of fire: 2,860 mm [9.38 ft, actual 2,790 mm [9.15 ft.]], hydraulic recoil brake with an initial

pressure of 50 +/- 1 kg/cm² [711 lbs/in², initial pressure of the air in the air recuperator], normal recoil: 820–900 mm [2.69–2.95 ft.], maximum recoil 920 mm [3.02 ft.], falling block action opens manually, horizontally to the right, fired electrically, elevation +18° -5°, turret traversable 360 degrees, initial velocity of the projectile: 920 m/sec [3,018 fps].

Ammunition Types:
a. Armor piercing: 29 kg [63.9 lb.], length 775 mm [30.5 in.] [actual 28.3 kg [62.4 lb.], length 496.5 mm [19.55 in.]].
b. High-explosive: 25.8 kg [56.88 lbs, actual 28 kg [61.7 lb.]], charge: 15.1 kg [33.29 lbs, meaning the propellant charge in the cartridge], total weight: 55.75 kg [122.91 lb.], length: 527 mm [20.75 in, actual 623 mm [24.5 in.]], overall length: 869 mm [34.2 in.].
Combat complement: 25 rounds [2 × 24 rounds in the turret alone! Also see the note concerning the 75 mm gun].
- 75 mm gun, overall length of gun: 2,750 mm [9.02 ft.]; caliber length L/36.6, barrel length: 2,275 mm [7.46 ft.], the barrel has 28 riflings, width of a rifling: 3.6 mm [0.14 in.], depth of a rifling: 0.7 mm [0.028 in.]. On a pedestal with the 128 mm gun.

Ammunition Types:
a. Armor-piercing: 8.15 kg [17.97 lb.]
b. High-explosive: 7.1 kg [15.65 lb.]

Combat complement: 28 rounds [25 in the turret alone. Maus 205/1 had no ammunition rack in the hull; consequently, the total number of rounds was not known, for everything was destroyed in Maus 205/2.]

Remaining equipment: one MG 42 machine gun, 7.92 mm, elevation range +13° to -8°, coaxial with 128 mm gun [the installed MG 34 was known, which can only mean no machine gun was installed when the tank was blown up or had never been installed. No machine gun flash suppressor is visible in the photo in VersKraft Kummersdorf in January 1945.]

4. Armor

Welded, also joints with pins. Front hull: upper plate: 200 mm [7.87 in.] 55°, lower plate: 200 mm [7.87 in.] 35°, upper side plate: 185 mm [7.28 in.] 0° (+5 mm), lower side plate: 105 mm [4.13 in.] 0° (+ 5 mm), inner side plate: 80 mm [3.15 in.] 0°, upper rear plate: 160 mm [6.3 in.] 35°, lower rear plate: 160 mm [6.3 in.] 30°, forward hull top: 105.5 mm [4.15 in.] 90° (+5 mm [0.2 in.]), forward hull floor: 105.5 mm [4.15 in.] 90° (+5 mm [0.2 in.]), forward track guards: 100 mm [3.94 in.] 13°. Turret front: 210 mm [8.27 in.] curved (approximately 230 mm [9.06 in.]), turret side: 210 mm [8.27 in.] 30° (+10 mm [0.394 in.]), turret rear: 210 mm [8.27 in.] 12° (+10 mm [0.394 in.]), turret top: 105 mm [4.13 in.] 90° (+5 mm [0.2 in.]).

5. Propulsion

Gasoline aero-engine with fuel injection, Type DB 603-A2 [actually MB 517 or 509], installed longitudinally, output 1,750 hp [actual 1,200 or 1,080 hp], twelve cylinders, 60° inverted vee configuration, displacement 44.5 liters [11.76 gals], 162 mm [6.38 in.] piston diameter, compression 1 : 7.3–7.5 [MB 509 in reality = 1 : 5.9+0.1 right cylinder bank, -6.1+0.1 left cylinder bank.]
a. Fuel system: B-4 grade gasoline (German designation) in 2 tanks each holding 1,560 liters [412 gals, actually 1,600 liters [422.7 gal.] gas or diesel], 1,500 liter reserve [396.3 gals, actually 1,000 liter [264 gal.] external tank; also not present]. Fuel pump: 12-cylinder Bosch injection pump with injectors, mechanical centrifugal supercharger, maximum overpressure 1.4 kg/cm³ [actual 1.225 atm]

6. Electric Drive

a. 1.05 ratio engine generator
b. Siemens-Schuckert SW-305/30 double generator normal voltage 560 Volts, maximum voltage 800 Volts, normal output 450 kW
c. Electric motors: 2 Siemens-Schuckert D 2185, normal voltage 560 Volts, maximum voltage 775 Volts, 415 kW output at 1,160 rpm

7. Running Gear

Cast tracks made up of three different links: one track has 112 links (56 complete links and 56 connectors), width is 1,100 mm [43.31 in.], height 160 mm [6.3 in.], cast drive wheel, two removable sprockets each with 17 teeth, tooth spacing 158 mm [6.22 in.], tension pulley with spindle located forward, each side has six bogies sets each with four cast wheels consisting of a metal disc and inner rubber insert, diameter 550 mm [21.65 in.].

8. Performance

Maximum speed 20–25 kph [12.4–15.5 mph, higher speed due to more powerful engine, i.e., the DB 603A aero-engine installed by the Soviets], speed off-road: 4–10 kph [2.49–6.21 mph].

II. Armor Protection

1. Hull

The German Maus super-heavy tank is of welded construction, with armor plates from 40 to 200 mm [1.57–7.87 in.] thick. Unlike known German tanks, the Maus super-heavy tank has no hatches or seams in the front armor plate that could reduce strength. The vertical side armor plates are rolled in a single piece. Thickness varies. Thickness in the upper area is 185 mm [7.28 in.] and 105 mm [4.136 in.] in the lower area. There it is milled off at a height of 780 mm [30.71 in.]. The lower part is used to mount the running gear and protect against shell fire. At the front, the tracks are partially shielded by 100-mm-thick [3.94 in.] covers. The removable radiator and engine covers are armored to a thickness of 50 mm [1.97 in.]. The driver's compartment cover is 105 mm [4.136 in.] thick. Two 60-mm-thick [2.36 in.] deflectors are welded in place to prevent the turret from becoming jammed by hits between the hull roof and turret ring [this only applies to Maus 205/1, as from Maus 205/2 two deflectors for the fuel tank filler points were also added]. The floor of the forward section is 105 mm [4.136 in.] thick, the rest of the floor 55 mm [2.147 in.]; the inner plates are between 40 and 80 mm [1.57 and 3.15 in.] thick. The described distribution of armor thicknesses reflects the designers' efforts to provide equal protection. Bolstering the armor of the forward floor and roof made it significantly more resistant to fire. All of the main plate joints are interlocking with a square pin. To increase constructive durability the joints also have cylindrical plugs similar to those used by the Ferdinand assault gun and the turret of the Tiger II. Diameter is 50–80 mm [1.97–3.15 in.]. The plate joints (roofs, floors, etc.) are made close together with double-sided welds.

2. Turret

The forward part has a cylindrical shape and consists of 200 mm [7.87 in.] cast steel. The side and rear plates are 210 mm [8.27 in.] thick. The roof plate is 65 mm thick [2.56 in, 105 mm [4.13 in.] farther up). The turret is constructed on the same principle as the hull (with pins).

3. Armor Strength

One can divide the chemical analysis of the rolled armor plates into four groups: up to 50 mm [1.97 in.] thickness with increased manganese content, armor with 0.5% nickel is used for the 65 mm [2.56 in.] plates. To 80 mm [3.15 in.] the chrome-nickel-molybdenum steel has a higher percentage of manganese and chromium. For the fourth armor thickness (200–210 mm) [7.87–8.27 in.], the amount of chromium used with the nickel-molybdenum is striking. Compared to the lesser thicknesses, the percentage of chromium and nickel has been increased by up to 0.8–2%. There are two types of cast armor: in lesser thicknesses the chromium-nickel-molybdenum armor has a higher manganese content, while armor thicknesses of 220 mm [8.66 in.] have a nickel content over 30%.

III. Construction of the Tank

1. The 128mm gun

Type 1944, consists of the barrel, breech, cradle, carriage, aiming mechanism, and other parts.

2. The 75 mm gun

Generally this is attached to the right side of the 128 mm gun. Design is similar to that of the 75 mm gun of the Panzer IV. The difference between them consists of the length of the barrel and the arrangement of the aiming mechanism.

3. The 7.92 mm machine gun

The Type 1942 tank machine gun is in the front of the turret to the left of the 128 mm gun and can be elevated independent of the 128 mm gun. The design of the machine gun is similar to the MG 36 [this is unclear, probably a typing error; notwithstanding, it is known an MG 34 was envisaged. It was surely not there, otherwise the error would have been noticed], the main difference being a greater rate of fire.

4. Aiming and Observation Devices

As there were no optical devices left in the tank, openings and mounts can only be used to presume which optical installations were present. The driver was provided with a fixed periscope, while to his right the radio operator was supposed to have a rotating periscope. For the tank's commander [for the gunner], to the left of the gun there was a sight whose head was located in a fixed armored

cap in the roof of the turret. The telescopic sight's mount was rigidly attached to the turret. The telescopic sight and the 128 mm gun were attached by means of a rhomboid. In the roof of the turret, the commander had a stereo range finder with a 1.2 meter [3.94 ft.] base and an observation periscope [how the investigator came to this conclusion is inexplicable, as there were neither openings nor provisions for a horizontal range finder and additional periscope in this turret. The vertical range finder was used for this purpose. There was a project for a horizontal range finder (Maus II), but it was never envisaged in the captured turret. The investigator could only have learned about this from various documents or witness interrogations].

5. Conclusions from Construction and Design

a. The use of two guns in one cradle had the following advantages: - increased firepower
- the more suitable gun could be used depending on the nature of the combat.
b. Placement of the turret in the rear part of the tank reduced the barrel overhand and contributed to improved maneuverability in a wooded area.
c. The designs of the 128 mm and 75 mm offer nothing of particular interest.
d. Performance of the 128 mm is similar to that of the 122 mm S 26-1 gun [in *ISU-122-3*], and the 75 mm KwK is similar in performance to the 76 mm gun of the T 34.
e. Because of the absence of an automatic breech opener, the 128 mm KwK's rate of fire is lower than that of the 122 mm D 25 gun [in the IS 2 and IS 3].
f. The ratio of the Maus tank's weight to that of its armament is 60—that of the IS-3 tank 17—confirming the discrepancy of the Maus tank's weight and equipment.
g. The use of a range finder in a tank is basically a new question and requires special research.

IV. Propulsion

Installed in the tank is the powerful Mercedes-Benz DB-603 A2 aircraft engine, which produces 1,750 hp at 2,700 rpm [the error with respect to the engine as noted]. This is a four-stroke engine with mechanical supercharging. Mixture formation does not take place in a carburetor; instead, it happens in the cylinders by means of injection.

V. Power Transmission

The tank has an electromechanical power transmission system. It consists of two independent elements working in parallel, each with one track. The electrical component is made up of two independent electrical systems that ensure that torque from the engine crankshaft is transmitted to the drive wheels.

1. Generators: the two main generators produce power for the electric motors. These are mounted in the center of the hull behind the engine. In block with the main generators is the third, auxiliary generator, whose armature is installed on a shaft with the rear generator.

2. Electric Motors: the electric motors are mounted in the rear part of the hull above the tracks. The torque from the electric motor's shaft is forwarded to the drive wheel by means of a two stage intermediate gearing.

The particular use of the electric system

The design of the Maus tank's electrical system allows generator energy from the supplying tank to be fed to other electric motors [for example, another tank traveling under water]. The possibility of the tank's electric motors receiving power from another tank has also been envisaged. The energy is transmitted with the help of cables.

The special case of the utilization of the transmission of electricity

Speed is determined by the amount of energy produced.

Straight ahead driving. Both control levers are simultaneously pushed forward from the neutral position. Electricity is supplied to an excitation winding of the generators, causing the tank to move off. To increase the tank's speed the output of the main generators must be increased. To do this the control levers must be pushed further forward. The tank's speed can be increased by reducing the magnetic current of the electric motors, which is achieved by pushing the control levers all the way forward. This speed is only possible in good driving conditions to avoid damaging the electric motors.

Driving in reverse can be achieved by pulling the two control levers back through the neutral point. This changes the direction of the current in the excitation windings of the main generators and with it the polarity. The tank begins moving backwards.

Making a large-radius turn is achieved by activating the electric motors on the side in whose direction the turn is taking place. This is achieved by decreasing the load of the corresponding generator.

Small-radius turn: here the electric motor of the lagging track is selected as generator. The energy from the electric motor is fed back to the corresponding main generator, which at the moment is acting as an electric motor and is powering the combustion engine and the 48 Volt backup generator.

To turn the tank around its own axis both electric motors are given a different direction of rotation. In this case one control lever is pushed forward and the other pulled back. One electric motor turns backwards, the other forwards. In doing so, one must reduce power and thus increase the mechanical load on the main generators.

VI: The Mechanical Components

In addition to the electric component, the power transmission system has two mechanical systems. The reduction gear with the parking brake or mechanical brake and the planetary drives inside the drive wheels.

VII: The Running Gear

The driver's position is located forward of the propulsion engine between the hull's main armor plates.

1. The cast iron tracks: each track consists of 56 one-piece and 56 divided links that are mounted reciprocally. The track is made of cast iron and is smooth on the inside with two or one-guide teeth in the middle. The ends are upturned. These ensure little resistance by the tank when turning.

2. Mounting: The running gear consists of 12 bogie sets, 6 per side. Each bogie set has two pairs of road wheels that are parallel to each other and turned 180° to each other. The two pairs in a bogie set are not connected to each other. Each bogie set bearer is attached to the inner hull side on one side and to the outer armor plate on the other.

General Conclusions

I. The engine with the generator block is located behind the driver's compartment. Such a power plant installation restricts access to the engine, makes installation and removal work complicated, and results in the fighting compartment being shifted to the rear.

II. Design of the hull and turret: If one compares the thickness of the Maus' armor with that of other modern tanks with a weight of 50–70 tons, it becomes apparent excessive armor protection is the reason for the increased weight. For the 180-ton tank, the thickness of the armor is unnecessarily important. Instead of the existing ratio of 0.5–0.6 between the thickness of frontal armor and the thickness of the side armor, the ratio for the Maus tank is 0.925. The Maus tank's armor protection shows the noteworthy tendency towards equal armor thicknesses on all sides. The design of the hull does not provide for the maximum exploitation of large design angles. If one compares the design of the hull shape of the Maus tank with that of the P V[Panther] tank, the former appears to be a step backward. Characteristic is the absence of hatches, seams, and the forward-firing machine gun in the frontal armor as seen on other German tanks. This is done to avoid unnecessarily weakening the front plate. The turret mounting is an original design. Systems of rollers are used instead of the usual turret ring mounted on ball bearings: three vertical rollers guarantee support of the turret on the horizontal track and the horizontal rollers serve to center the turret in the horizontal plane. Characteristic is the use of a lifting system to lower the turret when the tank is driving under water. For this purpose the vertical rollers can be lifted with the help of a worm gear and the turret can be lowered onto the turret ring.

III. Equipment: The presence of two guns (128 mm and 75 mm) shall probably increase firepower in comparison to other tanks, but firepower is insufficient for a 180-ton tank. The practicality of two guns with very different ballistic qualities in one turret served by one and the same crewmember (the gunner) is debatable.

IV. The Power Plant: The design of the cooling system is deserving of special interest. The use of two-stage fans assures compactness of the cooling system. Characteristic is the use of high temperature cooling of the exhaust system. The system of qualitative regulation of the cooling is also of interest because the barometric pressure and temperature conditions are taken into consideration.

V. Power Transmission: among the special features of the electric element of the power transmission system is the independence of all tracks; the generators' ability to provide the electric motors almost uniformly with power in turns under different loads; and the presence of an auxiliary power unit which, in addition to its primary function of independent excitation of the generator and motor windings, also acts as the engine starter and battery charger. Further, the uniform regulation of the speed of the electric motors and thus the speed of the tank with minor losses; and the engine generator system's defenselessness against overloading of the electric motors.

VI. The running gear: The use of rectangular rubber pads [the rubber limit end stop] is borrowed from American tanks, with the goal of increasing the number of rollers for a high load bearing capacity. Use of rubber pads as an additional suspension element has as its objective the limiting of the travel of the knee levers when suspension travel is high. Examination of the running gear components revealed the majority of the rubber pads had either been lost or destroyed [also see 1995 photo]. Consideration should also be given to the return rollers integral with the bogie sets, which function reliably. The condition of the tracks was also good.

Summary

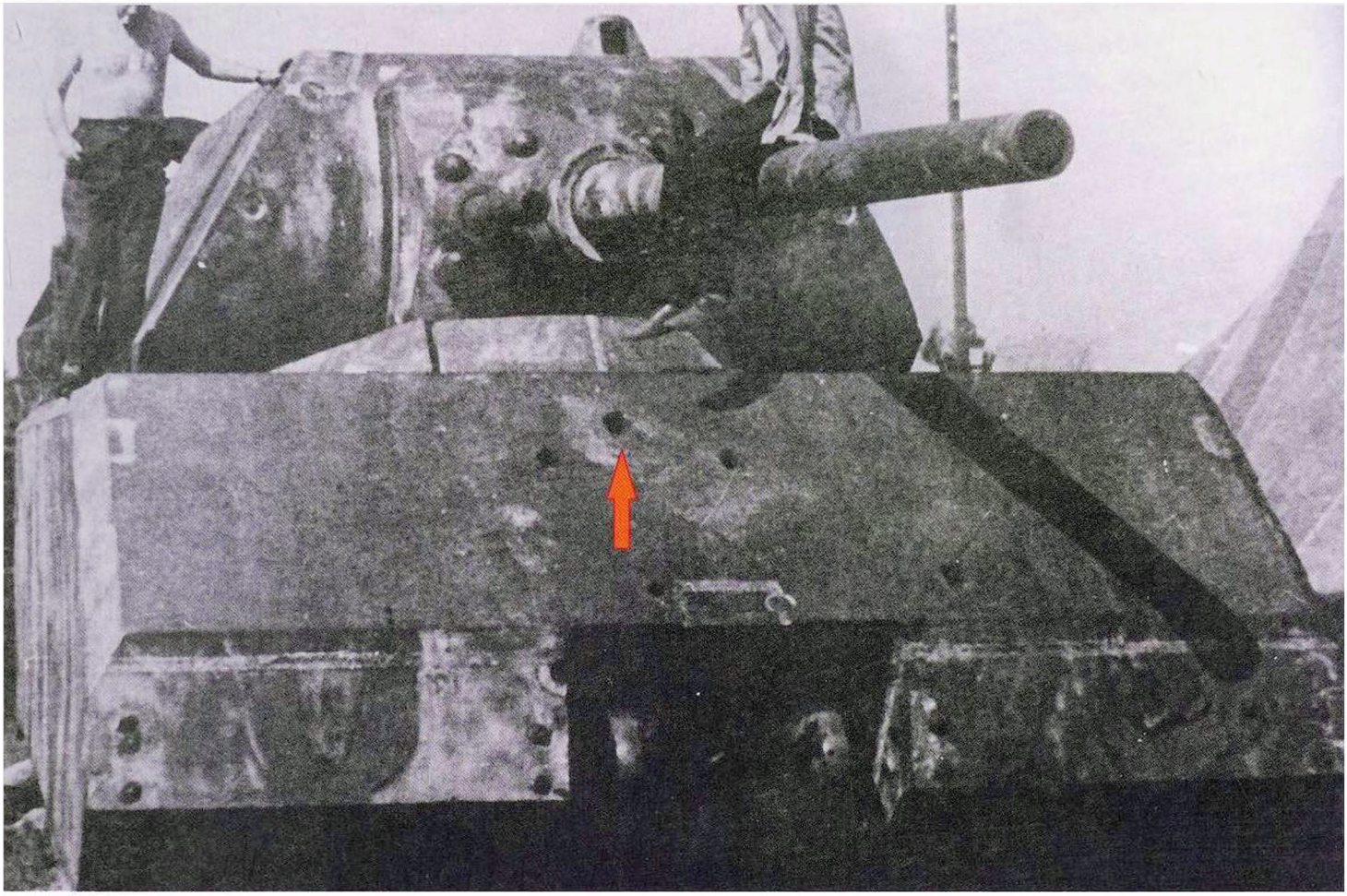
The German Maus tank is the first existing and tested example of a super-heavy tank. The armor protection (maximum armor thickness 210 mm [8.27 in.]) and firepower (128 mm and 75 mm guns) do not correspond to its weight. With their armor protection and equipment, modern (Soviet) tanks and self-propelled guns weighing 60–70 tons do not need to hide from the Maus. The excessive weight of the Maus tank is explained by the effort to provide maximum protection to all armored elements of the hull and turret, as well as 100-mm-thick [3.94 in.] track guards. This unsuccessful composition led to these excessive dimensions.

Signed by Engineer Colonel Soetsch (and twelve other military scientists from various departments), deputy administrator of the NIBT proving grounds of the scientific test department ИНЖЕНЕР-ПОЛКОВНИК (СЫЧ).

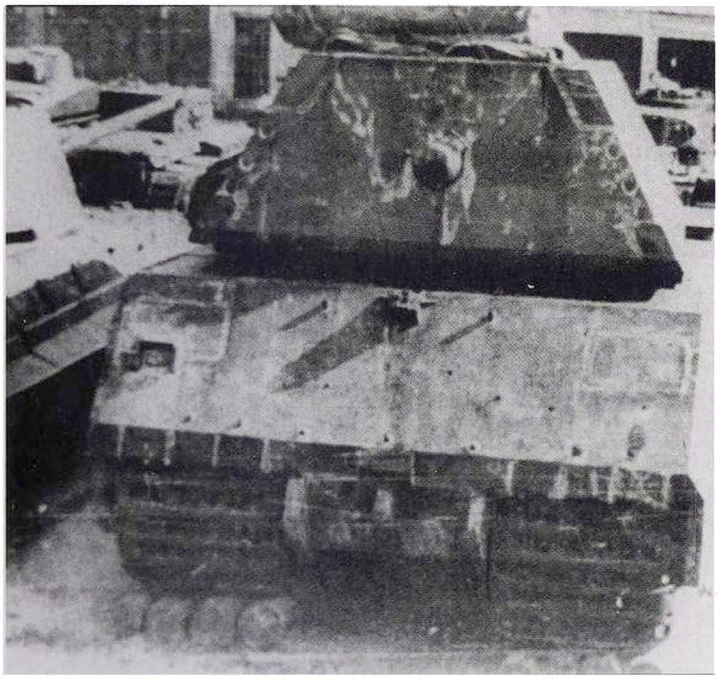
Supplement to this report: The Maus project envisaged a 150 mm KwK 44 L/38 gun, a 75 mm KwK 44 L/36, and two MG 34 machine guns. Ammunition complement was to have been 50 rounds of 150 mm ammunition and 200 rounds of 75 mm. The 128 mm KwK 44 L/55 was in fact installed in the first example. No tank with a 150 mm KwK was ever built. Test driving of the first vehicle with wooden turret (and a weight of 55 tons?) was carried out from December 23, 1943, until May 1944. In June 1944, the first tank [including the turret and 128mm gun] was fully completed. The MB 507 diesel engine was tested in one prototype. A total of ten tanks was supposed to be built and three were completed by May 1945.

After these tests, in 1951, all power units and fixtures were removed and certainly—as the report about the evaluation of six Ferdinand self-propelled guns in 1945 shows—were disassembled, accurately measured, and sent to various offices and factories (such as Factory No. 100) or research institutes (i.e., Research Institute No. 48 in Sverdlovsk). As a result, only the empty shells of these giants remain.

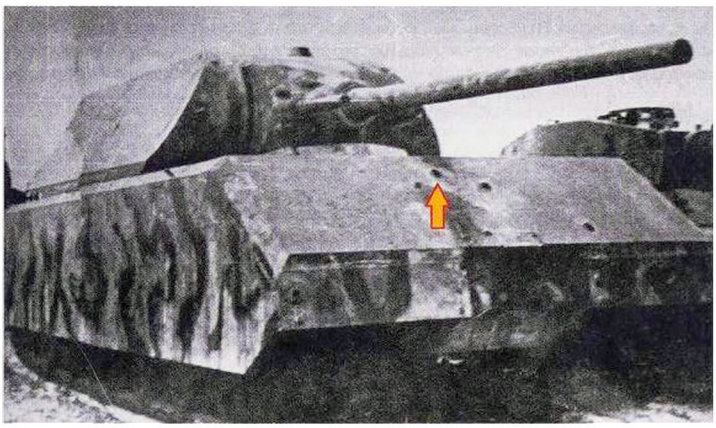
Until the opening of the Tank Museum for Tank Armament and War Materiel in Kubinka on September 10, 1978, the Maus—like the other captured tanks—sat in the open and silently rusted away.



Beginning with these photos taken in Kubinka, the additional shell hole in the center of the hull can be seen.



Once again, the timbers beneath the tank to tighten the sagging left track. The original colors are fading more and more.



The additional shell hole can be seen. Standing bolts, to which placards were probably attached, have been welded onto the two forward track shields. Beside the Maus is a King Tiger with turret number 102, formerly of the 502. schwere Panzerabteilung (502nd Heavy Tank Battalion).

Indoors in the Museum

The following is a series of interesting photos generously made available by Herr Duske. Taken in 1996, they show the Maus with fictitious camouflage and crosses.

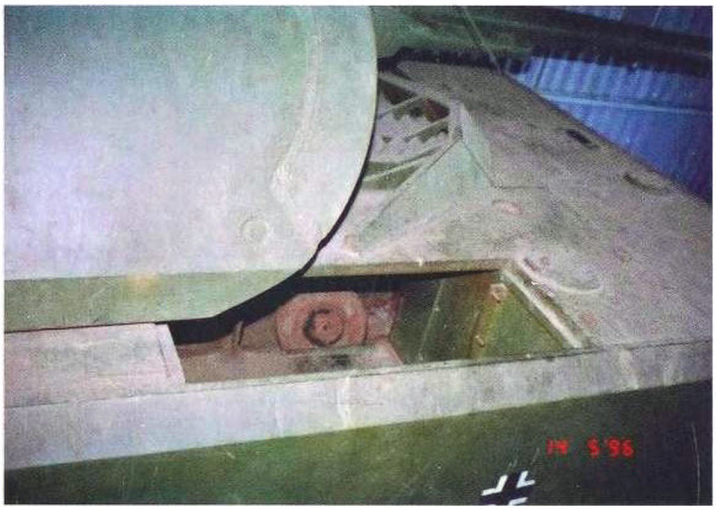
From the "Karl Device" to the Maus. At first glance the missing gratings on the right and left radiator openings are noticeable. The 128 mm/75 mm guns' trunnion mounts are also askew.

In this rear view of the hull, the outline of the welded-up opening for Maus 205/1's flamethrower can still be seen. In the center of the hull, above the cross, is the jettison lock for the external fuel tank. Above it on the turret is the ammunition hatch with the close defense opening.

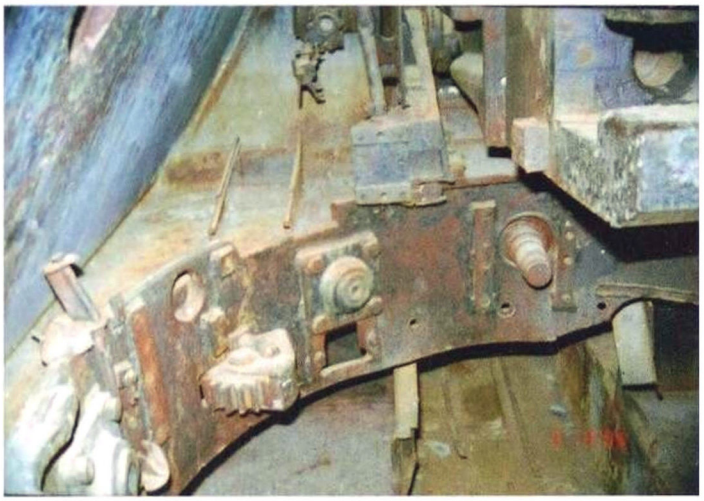
Moving closer, we see that other cover plates are also missing, like the left-side fuel tank cover with shell deflector and the left radiator grating. The ventilation grating for the left-side radiator with the circular opening for the exhaust is sitting in the wrong place.

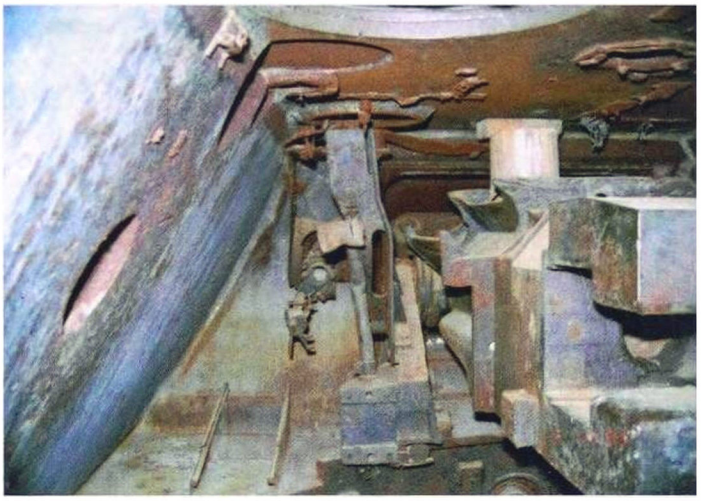
The left-side electric motor's wrecked ventilation grille is also in the wrong place on the right.

Visible are the machine gun opening and the massive gun mantlet. When tightened, the protruding pointed bolts sealed the mantlet for submerged travel.



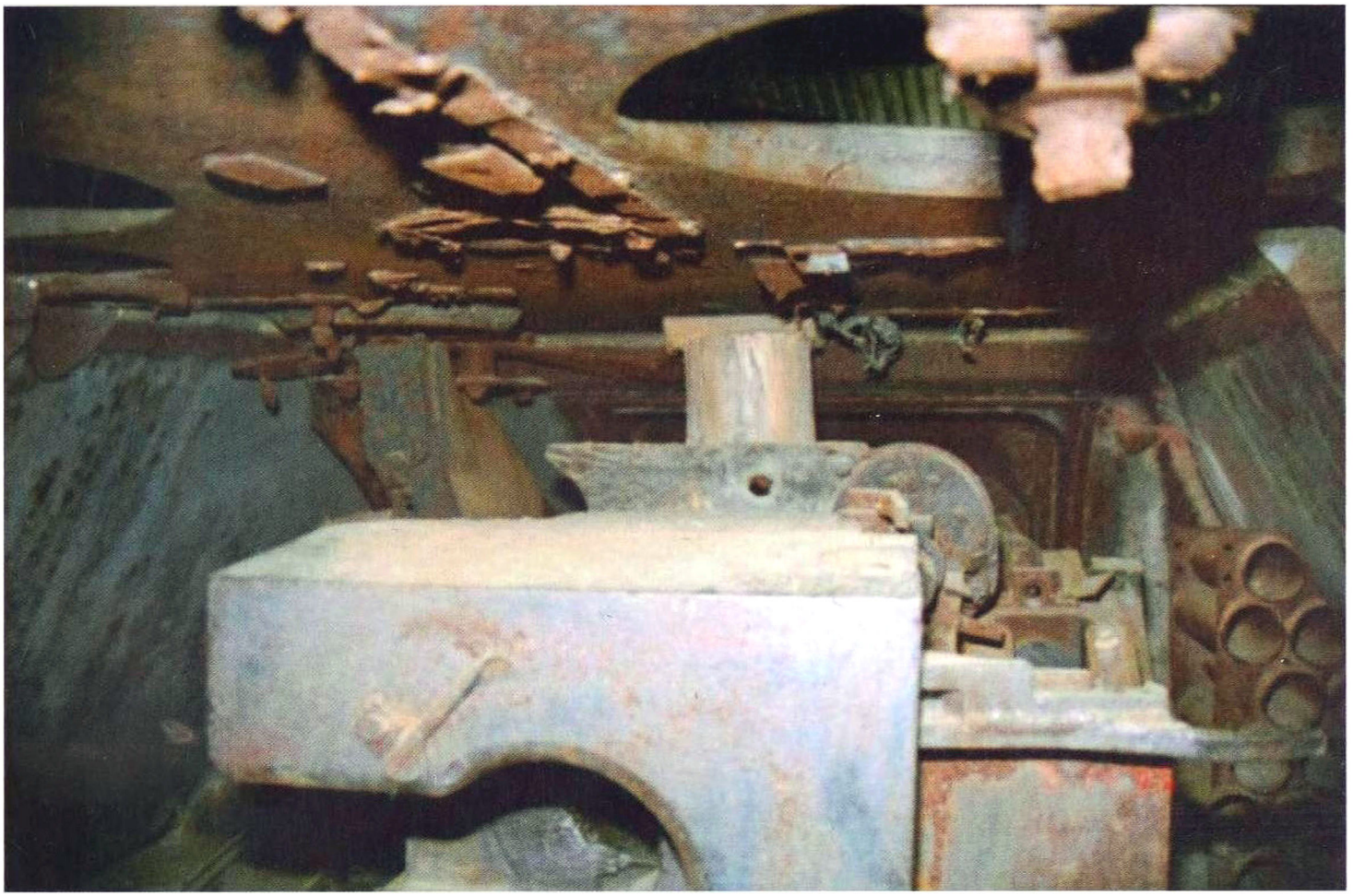
Here the misaligned gun can be clearly seen. Through the empty periscope mounting on the right can be seen the rack for the 75 mm ammunition.



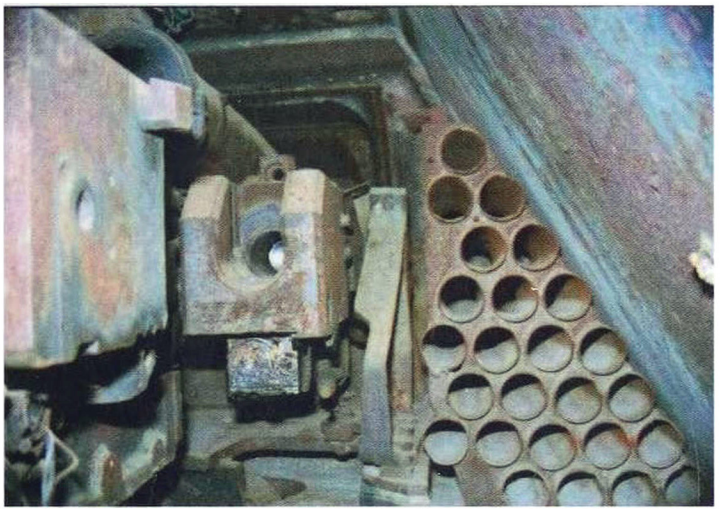


The interior after so many years in the open (without hatches)—rust everywhere. Left is the pinion for the missing turret traversing gear, above right the breech of the 128 mm KwK 44, and below the generator compartment. Above left is the submachine gun ball mount and in the background the machine gun mounting. Here the explosion blew out all; everything was either torn out, twisted, or mutilated by fragments. The gun is supported by a wooden block.

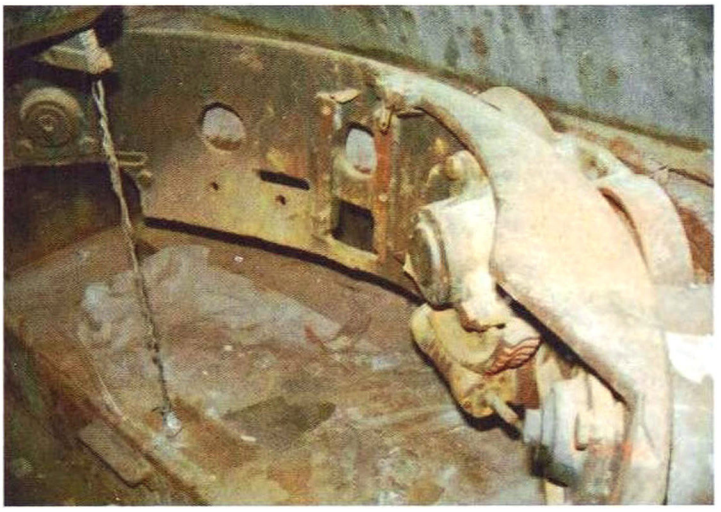
The MG 34 mounting with the battered periscopic sight mount in the center. On the right of the photo, the hydraulic recoil brake (left of the gun) is missing from the 128 mm main gun. The recuperator (right of the gun) is still present.



Forward view along the turret roof, where the wooden block supports the main gun.

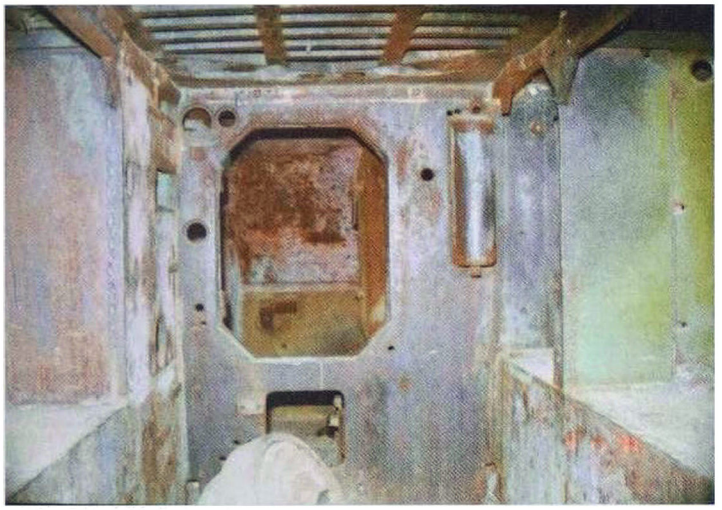


On the right side of the turret, the breech of the 75 mm KwK 44 with storage for 75 mm reserve ammunition. The ammunition racks were empty, consequently, there was no explosion and no resulting damage.



Here, on the right side of the turret, one can see the raising gear for lowering the turret onto a rubber ring to seal the turret when submerged. To the right of the turret bearer ring are the pairs of load bearing rollers.

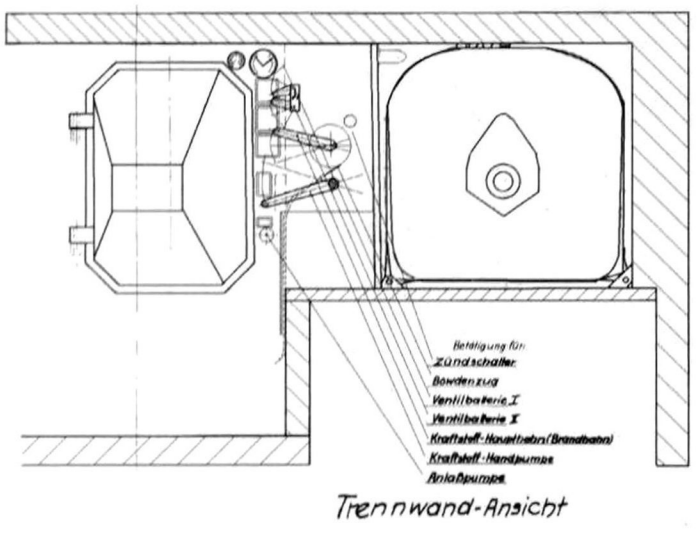
Moving forward through the empty generator compartment. Above right is part of the turret bearer ring with sprocket. In the passage where the 12-cylinder gasoline engine is suspended is a broken-off pair of road wheels. Left is an ammunition bin, and on the right, the compartment for the 48 Volt power unit and the turret traverse mechanism's Ward-Leonard drive.



Here we see the radiator compartments on the left and right. Above is the engine grating.

The empty driver's compartment. To the right is the radio operator's position. Through this hatch maintenance work could be done on the engine and the Riedel starter engine started. A crawlway to the turret and back was also provided.

View from the driver's position back to the engine compartment. Still clearly visible is the lettering on the wall for the fuel cock (on/off) and valve battery (see diagram on p 132 above left).

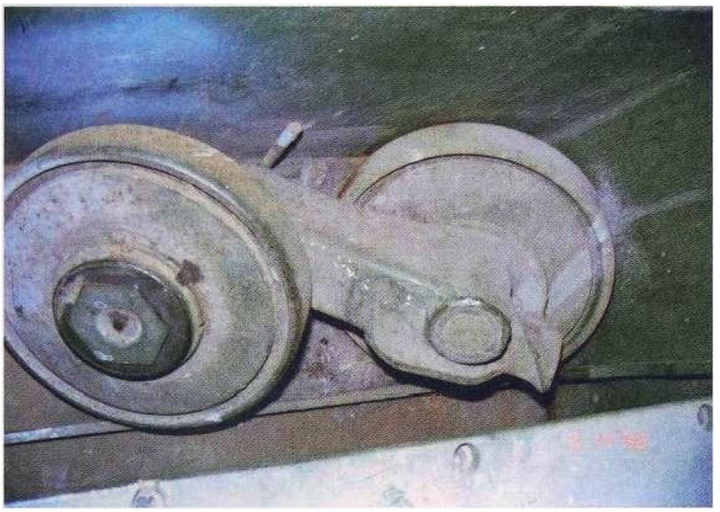


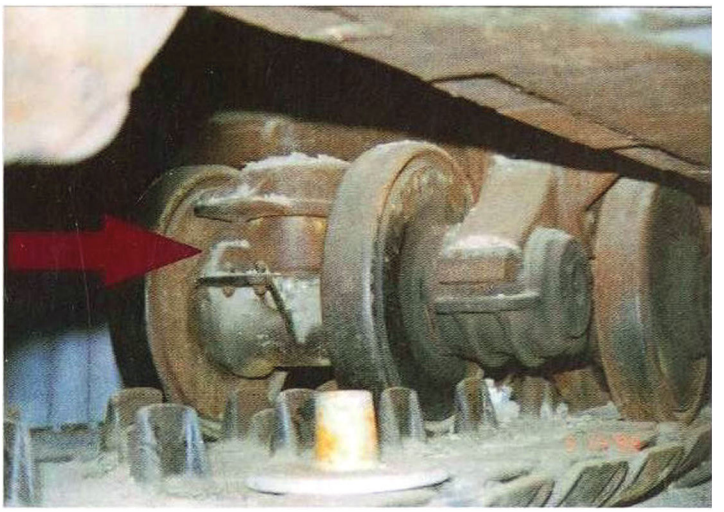
Trennwand-Ansicht

Way back in the direction of the turret. A view toward the generator compartment with the brake ventilation connections and the electric motor compartments on the sides.

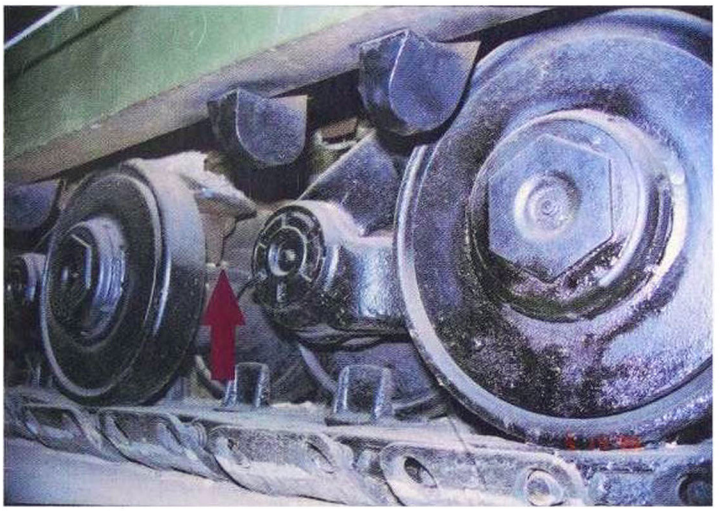
The view out to the turret hatch openings. In front is the massive 128 mm cannon breech tied down with wire. Clearly visible are the openings for the vertical range finder and the angled telescopic sight.

Here we see where the broken-off road wheels in the engine compartment came from. Two pairs of road wheels are missing at the left front. This was also the reason for the sagging left track in the previous photos. Above left is the engine maintenance hatch cover.





This view from behind clearly shows what the Soviet technicians meant by the worn rubber bumpers in the report, as they are almost all missing. The rear bogie set, which is also missing, has left a clear gap.



The absence of spring stops is also quite apparent from the outside. A detail of the roof structure shows the close defense weapon behind the ventilator. Next to it are the openings for the slings for lifting off the turret.

The interlocking plates, shear bolts, and the bow plate weld seams are clearly visible.

Four years later, in near to the original colors worn by Maus 205/2.

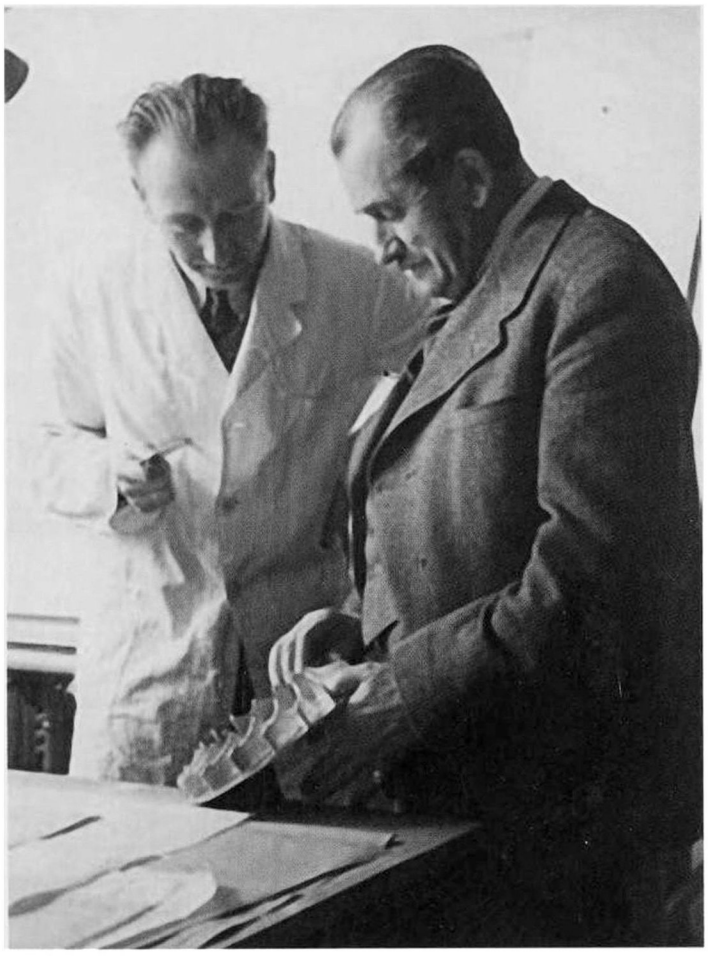
Below: the rear of the tank with the mirror-inverted hammer and sickle emblem (photo taken in 2009).

The Design and Testing Team

Professor Porsche and Chief Engineer Karl Rabe in 1951.

Ferdinand and Ferry Porsche in 1934.

Along with this highly complex design crammed with technology, the men who brought this gigantic machine to life are also worthy of mention. Undoubtedly, in first place is Ferdinand Porsche. He was born in Maffersdorf, near Reichenberg (Sudetenland), on September 3, 1875. Obsessed by technology even as a youth, he became an apprentice plumber in his father's company, but his real interest lay in the field of electrical engineering. After working in the tinsmith shop, in the evenings he attended electrical engineering courses. In 1893, Porsche went to the research department of the electrical engineering firm Bela Egger & Co. of Vienna as an apprentice. In 1898, he actively worked on the *Lohner Elektromobil* (a hybrid automobile) as head of the research department. Lohner had hired twenty-four-year-old Ferdinand Porsche away from Vereinigten-Elektrizitäts-AG. In 1900, he impressively demonstrated his creativity with the Lohner-Porsche, whose front wheels were powered by electric wheel hub motors. That same year he invented the world's first all-wheel-drive automobile, in which each wheel had a wheel hub motor and a brake. He also introduced the first fully functioning hybrid automobile. Two gasoline engines powered two generators that delivered power to the two wheel hub motors and charged the battery. The generators also served as a starter for the gasoline engine. Ferdinand Porsche had broken new ground technologically. The reader will recognize the similarity between this hybrid principle and the propulsion system of the Maus. The only difference was that, because of the amount of power required, the Maus could not drive on battery power alone, but the feeding back of brake energy was already going in the direction of hybrid technology. In the course of time Ferdinand Porsche designed many legendary cars, trucks, tractors, aero and marine engines, and ultimately wind power machines. Every well known car manufacturer courted this man. On December 1, 1930, Ferdinand Porsche formed his own independent engineering office on the Kronenstrasse in Stuttgart. He named it Dr.Ing. h.c. Ferdinand Porsche GmbH, Design Bureau for Engine, Vehicle, Aircraft, and Watercraft Construction. Porsche's staff consisted entirely of highly talented professionals who had become known to Porsche during his activity as technical director with various automobile companies and whom he remembered on account of their abilities and inventiveness. He lured his employees, who were experts in their various fields, away from all the leading car companies, even though they held senior, well-



Professor Porsche and Xaver Reimspieß.

Ghislaine E.J. Kaes in 1945.

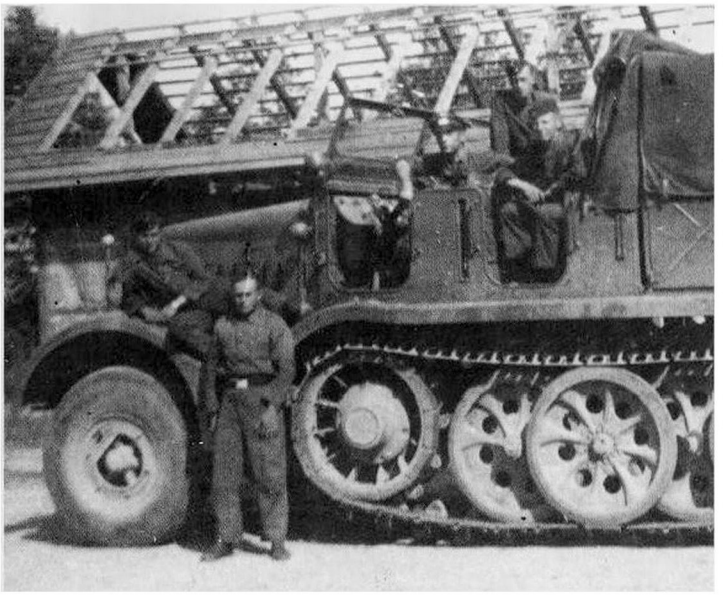
Engineers Fender, Kales, Ferry Porsche, and Zadnik (l to r) on June 22, 1944.

paid positions there. A fatherly and friendly relationship of trust formed the basis of their combined efforts. He spurred them to high technical achievement and bolstered team spirit. Porsche's staff would have gone through fire and flame for him. Despite being a member of the family, his nephew, Ghislaine E. J. Kaes—born in 1910 and also his private secretary—always called him "Professor" out of respect. For thirty years he was Professor Porsche's right hand. With him from the very beginning was his trusted friend Karl Rabe, born in Lower Austria in 1895. He met Professor Porsche at the Austro-Daimler company in 1913. He held the position of chief engineer in the new office. Karl Fröhlich (born 1898) came from the Steyr Company and took over the research department with Porsche. He was a transmission specialist and his inventions included the Volkswagen's four-speed transmission. Josef Zahradnik (born 1900), an axle and chassis specialist, also came from Steyr. Joseph Kales, from Northern Bohemia—an engine specialist and later Volkswagen's chief engineer—was also one of the originals. As a junior, the young "Ferry" A.E. Porsche (born 1909) was responsible for practical testing and took over the first independent projects. In 1940, he became deputy head of the office. Josef Goldinger was Professor Porsche's personal driver (master driver) and "maid of all work." He also came from lower Austria. Franz Sieberer was responsible for brakes and copying. Franz Xaver Reimspieß (born 1909) later joined the design bureau as an engine specialist; he was also the expert in tank development. Engineer Josef Mickl (born 1885), aerodynamicist and expert theorist, and Erwin Komenda of upper Austria (born 1904), expert in body design, were also recruited for the design bureau. The professor knew both from the auto maker Steyr. Erwin Komenda later became chief designer in Daimler-Benz's experimental and research department. Another comrade in arms was Herbert F.G. Kaes (born 1913), the professor's nephew and brother of Porsche's secretary Ghislaine E.J. Kaes. He was a test driver and liaison engineer to the Army Ordnance Office, especially WaPrüf 6 in Kummersdorf. Senior engineer Otto Zadnik (born 1887) was late joining Porsche's core crew. He was also Austrian and knew the professor from Austro Daimler AG, where he helped Porsche design the Austro-Daimler *Landwehrzug* (Territorial Army Train) and the C-trains. Previously he had

Senior engineer and electrical specialist Otto Zadnik in the Maus.

Karl Gensberger on Maus 205/1.

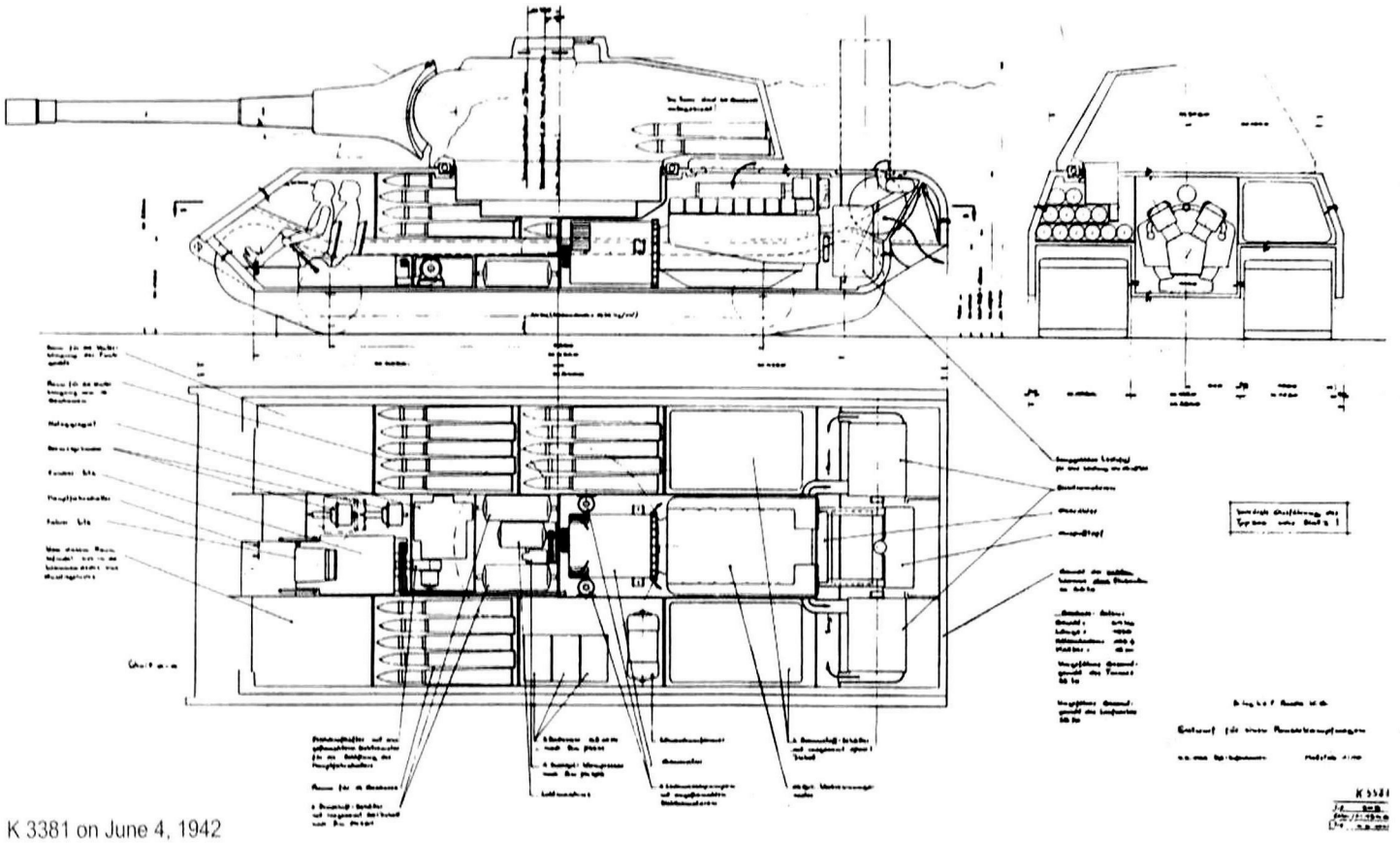
Behnisch.



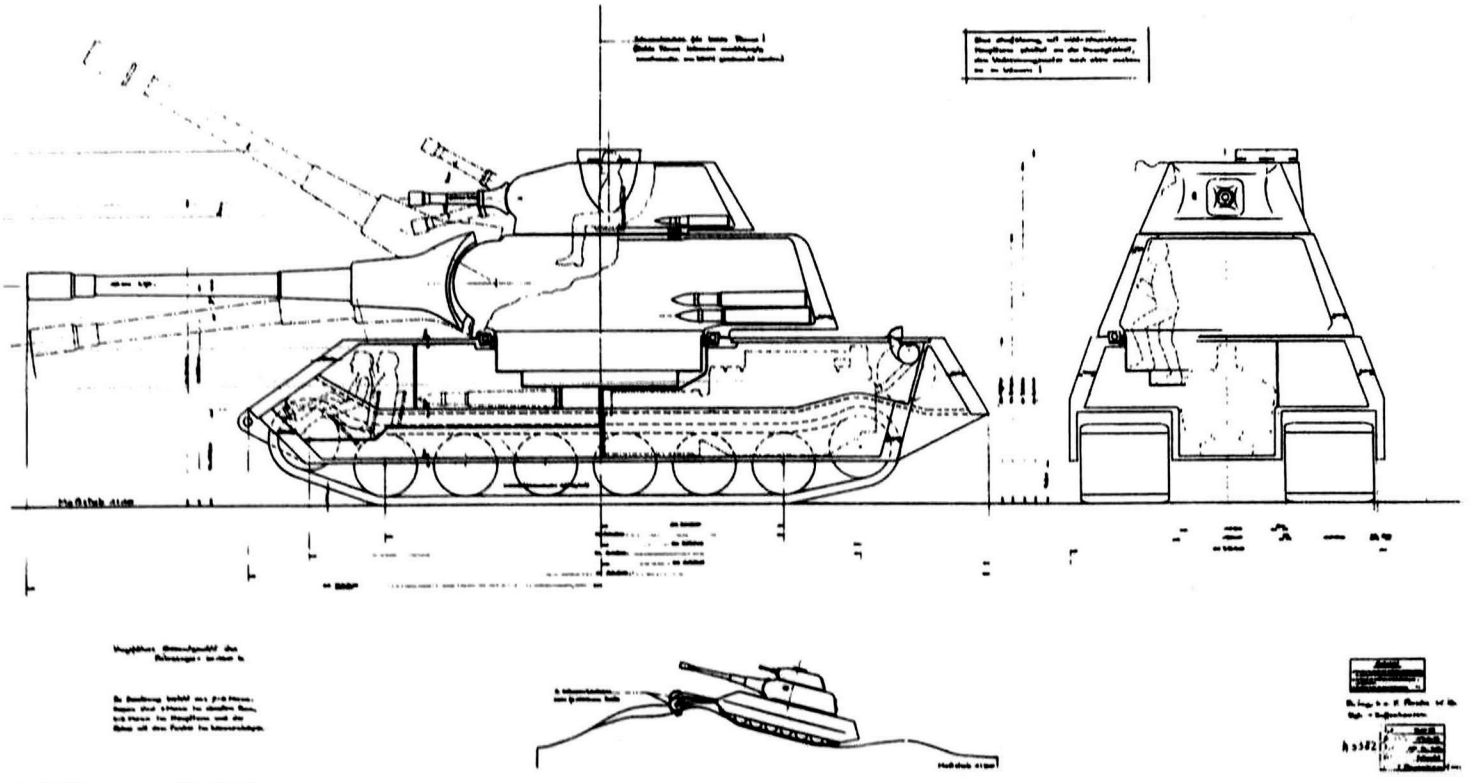
Zebitz and Hantschik with an 18-ton prime mover.

worked on the design of aircraft engines. His field was the development of gasoline-electric drives and turbine drives for tanks. Together with Siemens, he developed the Maus' complex electrical system. Other team members were senior engineer Martin and engineers Walter Schmidt—responsible for the mechanical part of the Maus; Leopold Schmid (known from the project drawings), who designed the running gear and tracks; and Ulrich, who designed the reduction gear and planetary drives. Willy Müller was the Porsche company's government representative in Berlin, Johann Kern the company's head of sales in Stuttgart-Zuffenhausen under Hans Baron Veyer Malberg (born 1886), Eugen Schlichter was test driving engineer (among other things was with the VW-Kübelwagen in Africa), and not to be forgotten the two Porsche drivers who tested the Maus, namely Karl Gensberger (joined Porsche in 1938 and tested the Ferdinand self-propelled gun in St. Valentin; he also accompanied *Panzerjägerabteilung* 634 and its tank destroyers to Russia) and Heinz Gröschl as second test driver at Böblingen. These are just some of Professor Porsche's prominent staff. The staff of Dr. Ing. H.c. Porsche GmbH, Design and Consultation for Engine and Vehicle Construction grew from nineteen employees in 1931 to 117 employees and 174 workers in 1940. Only the names of the leading Krupp employees are known: Director Professor Dr. Müller; Director Dorn; Dr. Bankwitz; Dr. Aureden; Dr. Lucke; senior engineer Talmon and Herr Simon of the 2nd Mechanical Workshop; senior engineer Vogt; Herr Lettmann and Schlösser of the Lettmann Department; Messrs. Hendel, Krause, and Lauterbach of the Hendel Department; and Messrs. Bender, Willecke, Derksen, Lohse, and Lauterbach of Artillery Design (AK). From Skoda were Chief Executive Pohl and Director Zubaty, and from Alkett of Berlin Director Freyberg and workshop manager Seitz of Factory III. As is known, after factory trials by Porsche in October 1944, the tank was tested by the Army Ordnance Office in Kummersdorf. WaPrüf 6 test drivers Behnisch, Zebitz, and Hantschick took part in the trials.

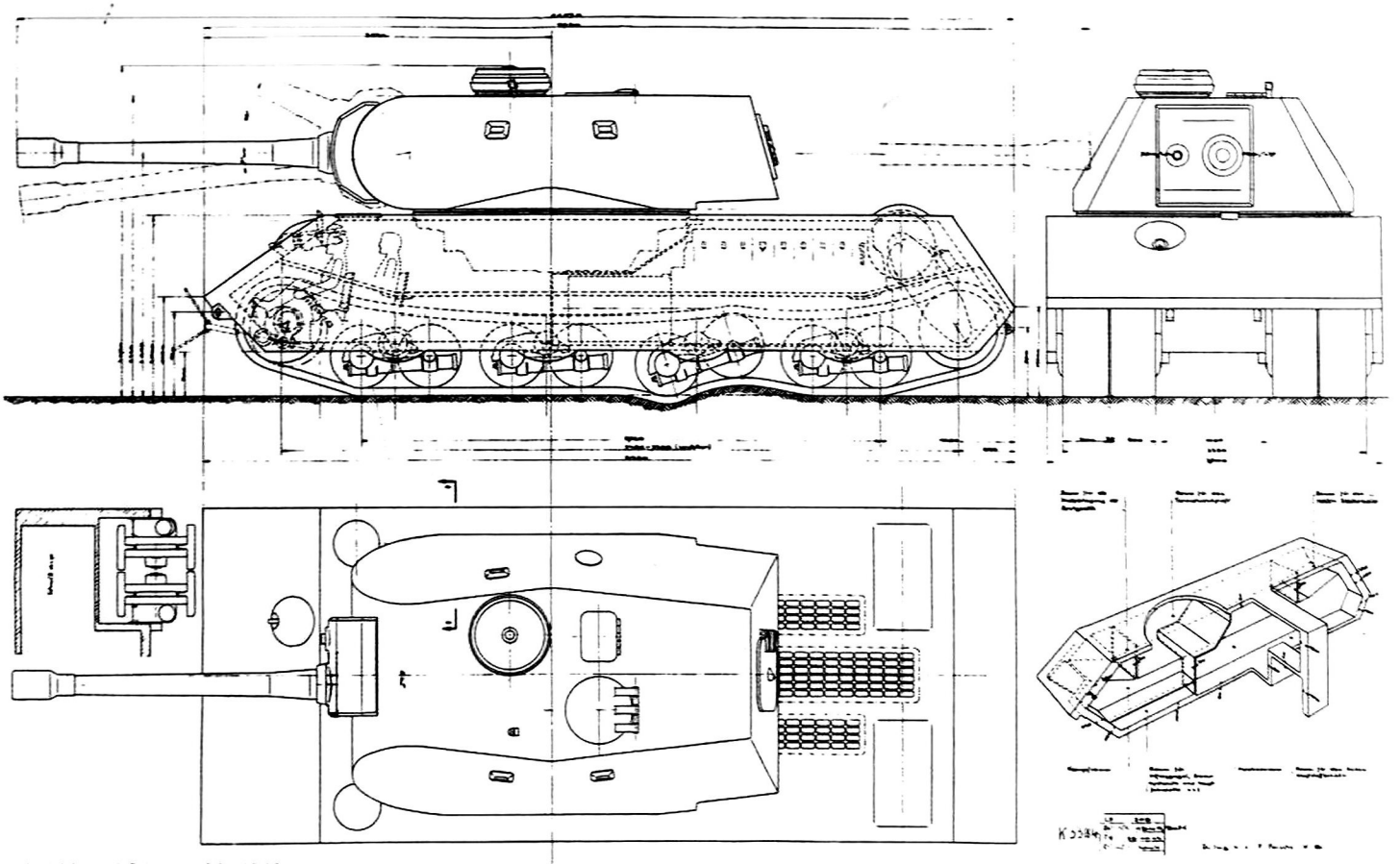
Technology in Detail



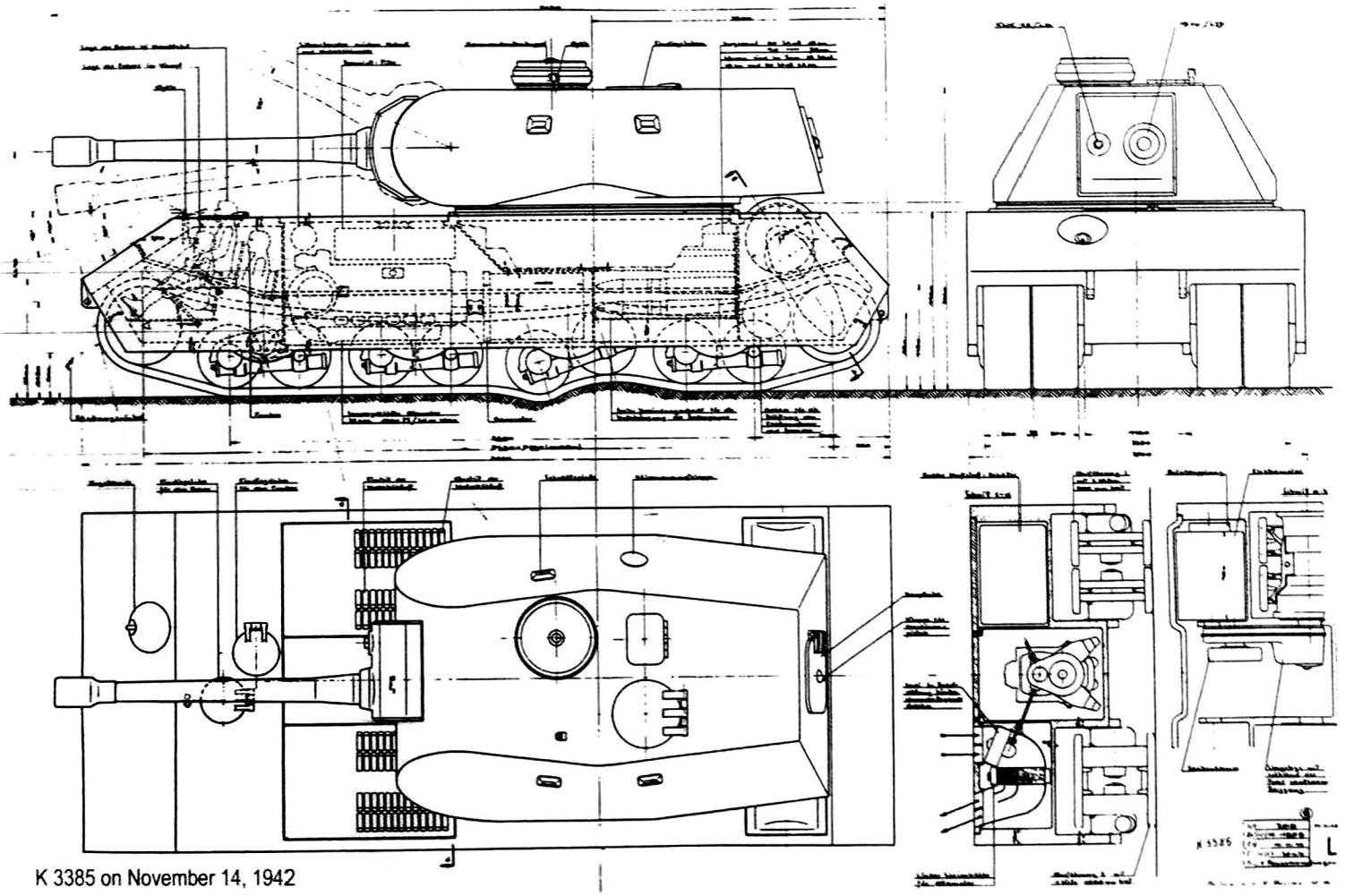
K 3381 on June 4, 1942



K 3382 on June 17, 1942



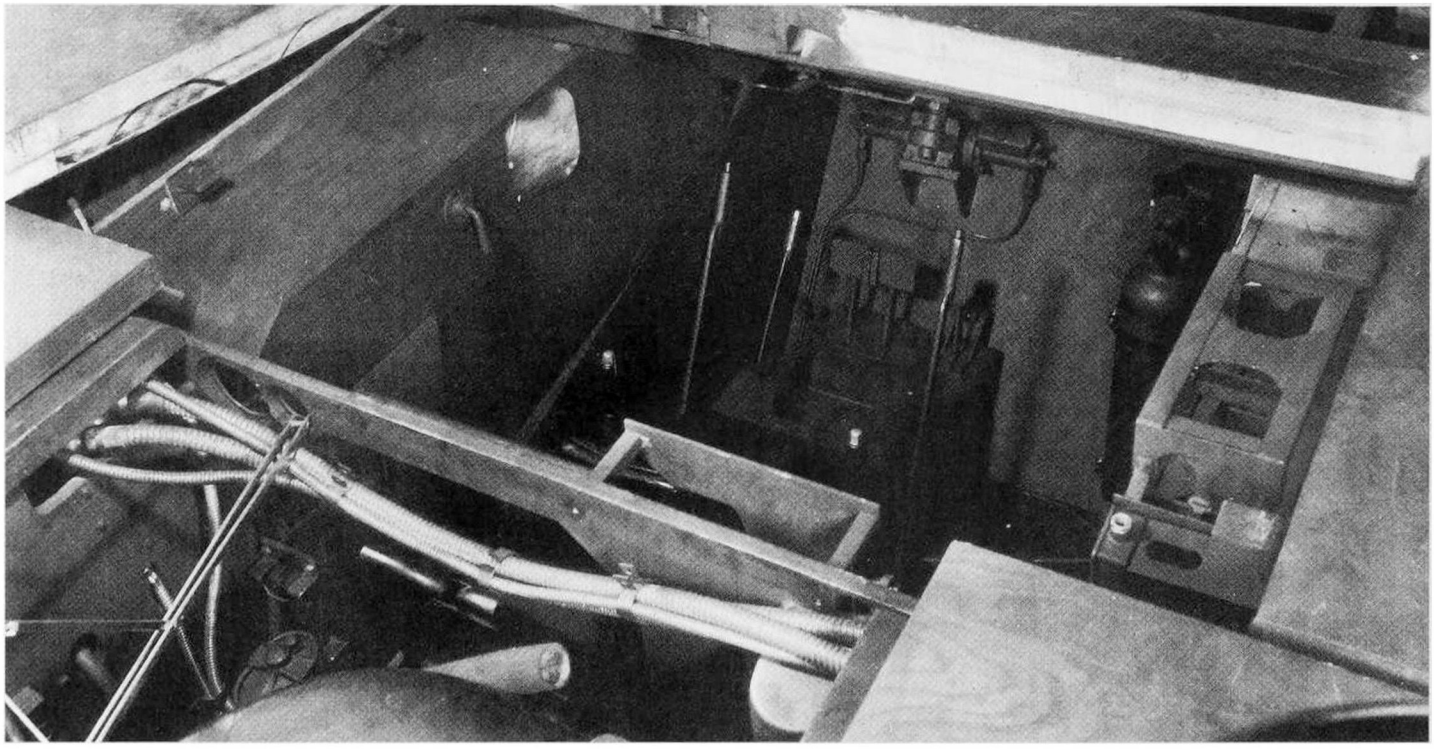
K 3384 on October 28, 1942

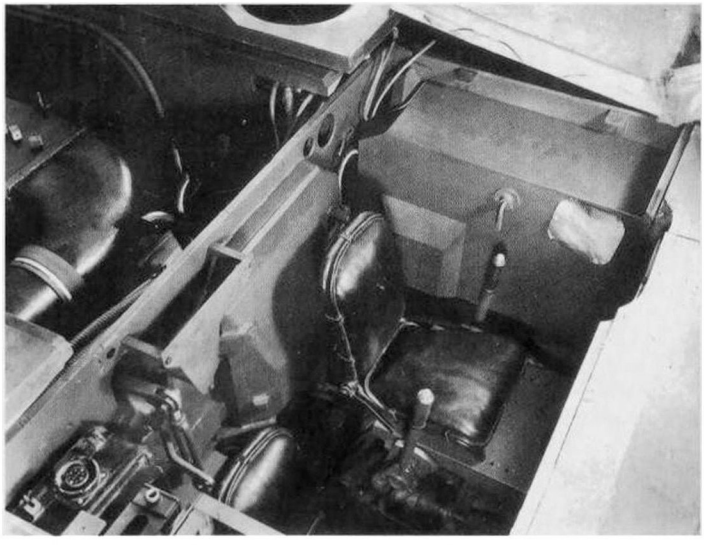


K 3385 on November 14, 1942

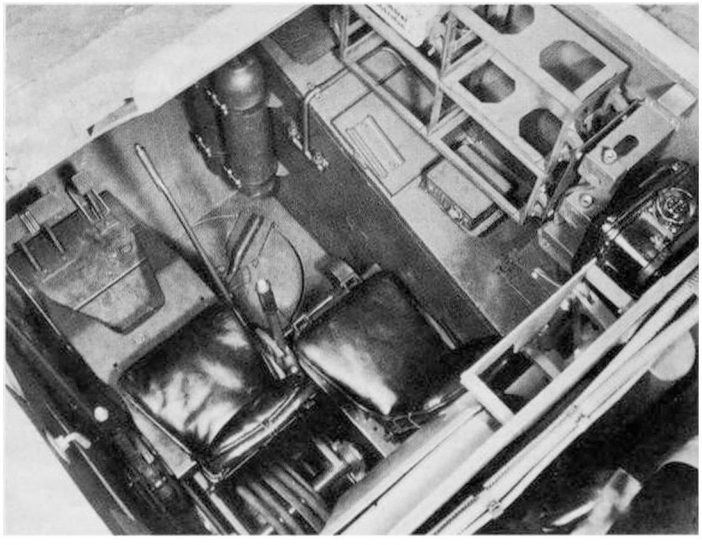
The Porsche Company's Wooden Model

This one-to-one scale model was made to get a feeling for the proportions and anatomical freedom of movement of the crew. The lessons learned were also of significance to assembly and later repairs. In addition to wood, some original components were also used in its construction. The warm exhaust air from the air-cooled engine was used to heat the engine compartment. Behind it were the Dräger environmental control system and the heating fan. Faintly visible in the background is the cylindrical transformer, the Leonard machinery for the turret traverse. The Leonard machinery is a transformer that converts 48 Volts into a variable direct current of 330 Volts. (Previously the Leonard set was the

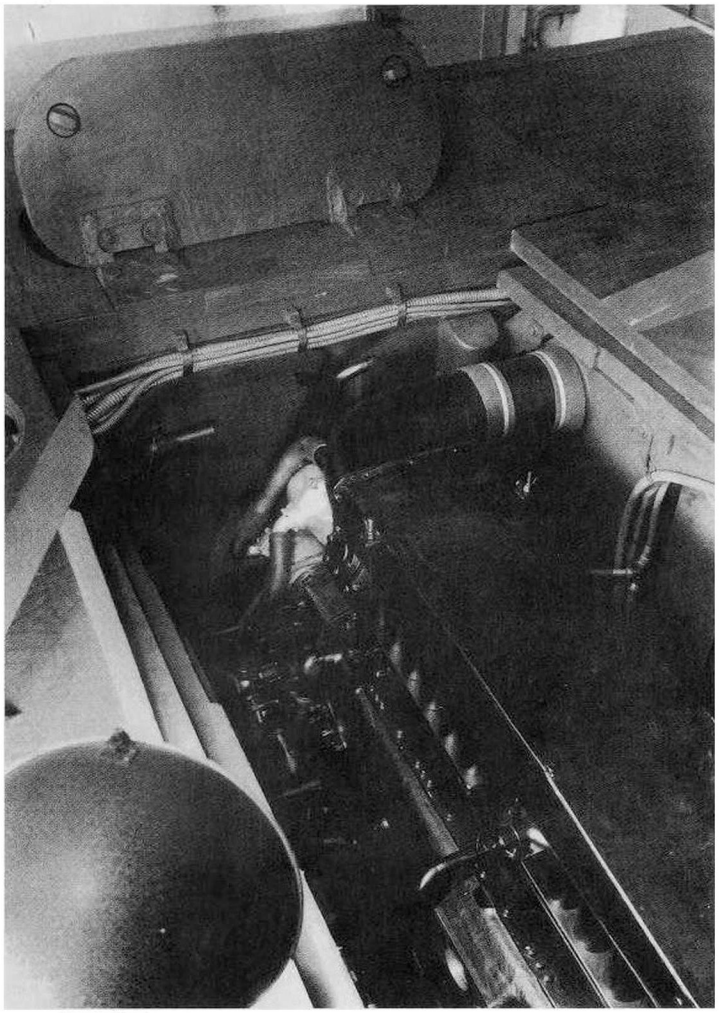


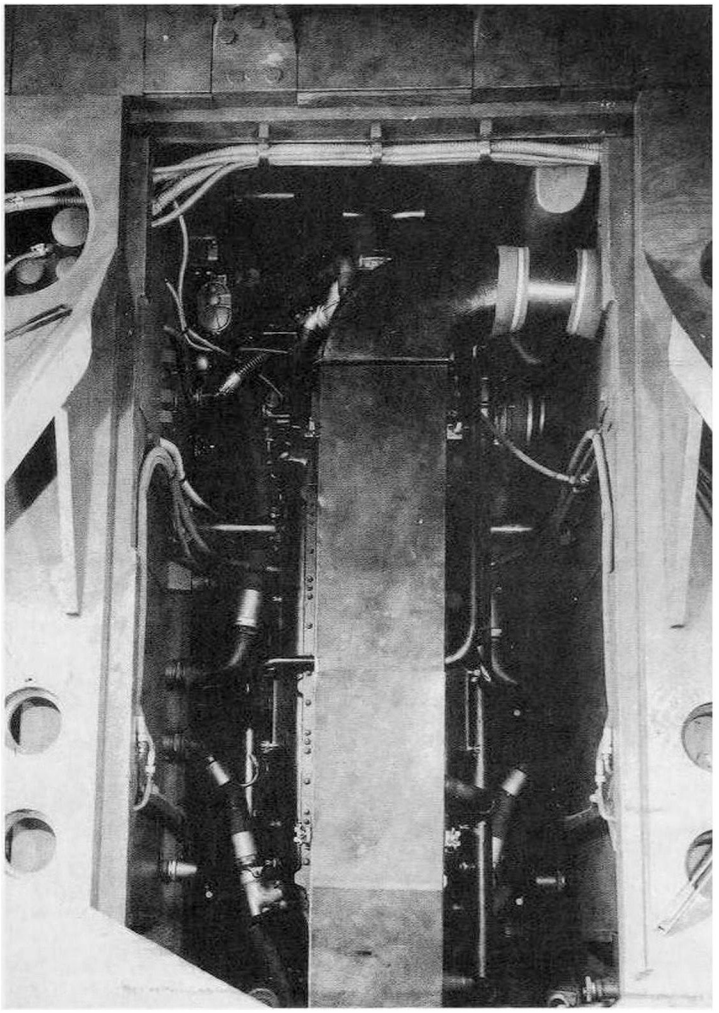


The driver's and radio operator's positions. The instrument panel to the right of the steering levers is not present.

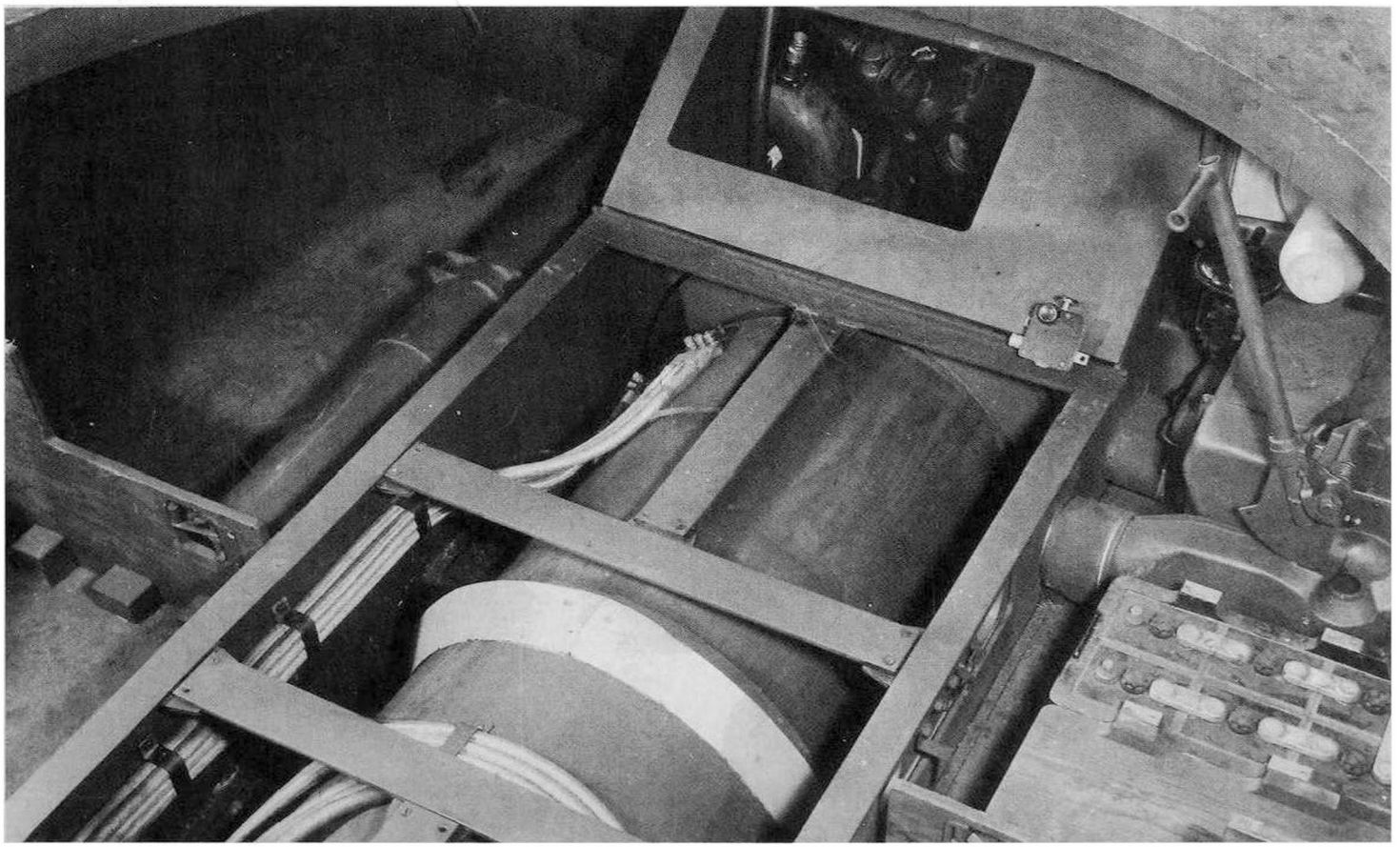


The pressure bottles for the fire extinguishing system have been installed; only the fittings are missing. In front of the radio operator's seat in the floor is the emergency exit. The attachment frames for the radio equipment, intercom system, and the fireproof power sockets for the engine ignition quick release connections are to the right of the radio operator's seat.

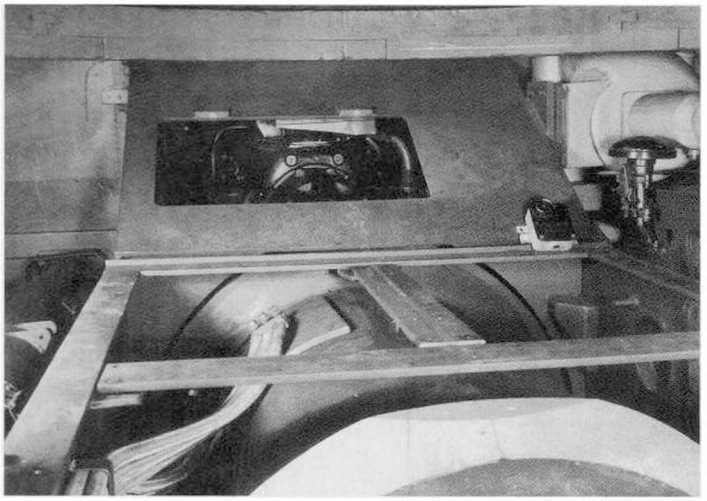


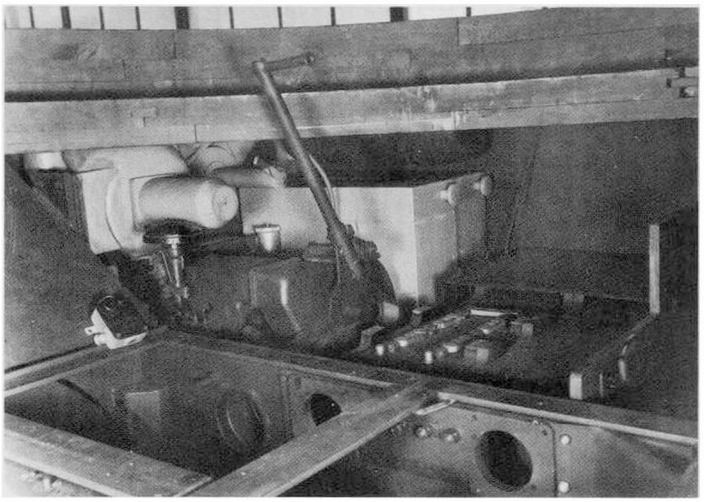


View of the MB 509 gasoline engine with the rectangular air filter cover on the engine. The large hose goes from the prefilter to the oil bath filter and from there to the mechanical supercharger.



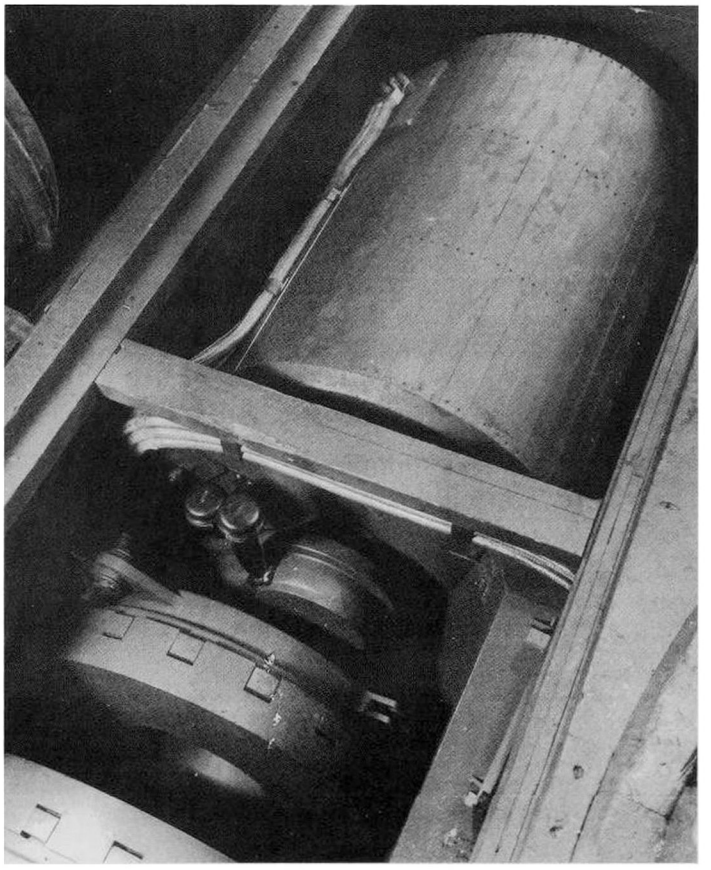
View from the turret area forward toward the double generator and, through the opening, the intermediate gearing on the MB 509 engine. Right is the battery (originally four batteries = 48 Volts) and the Type 141 auxiliary power unit; left is the ammunition spaces for 128 mm or 75 mm ammunition.



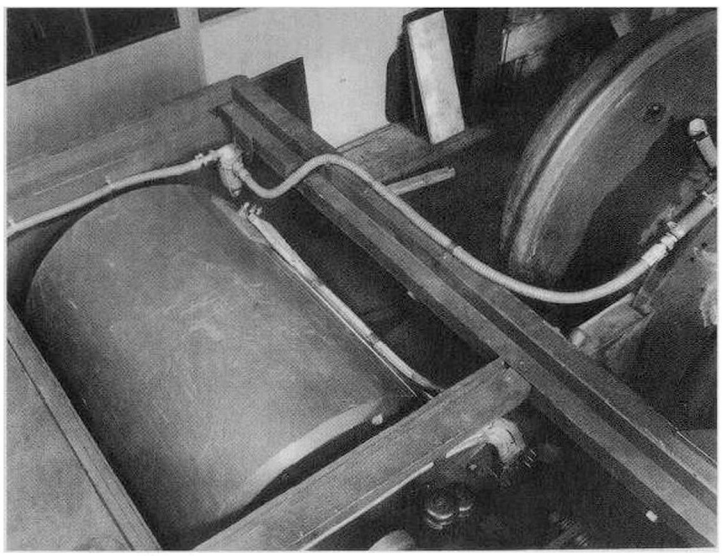


In the turret cutout: view to the right towards the battery compartment, the Porsche Type 141 auxiliary power unit (half a four-stroke VW engine, air cooled with a 48 Volt generator 5.5 Kilowatts), which produced power for charging the batteries, for the environmental control system's heating coil, and for the 128 mm gun's bore evacuator compressor.

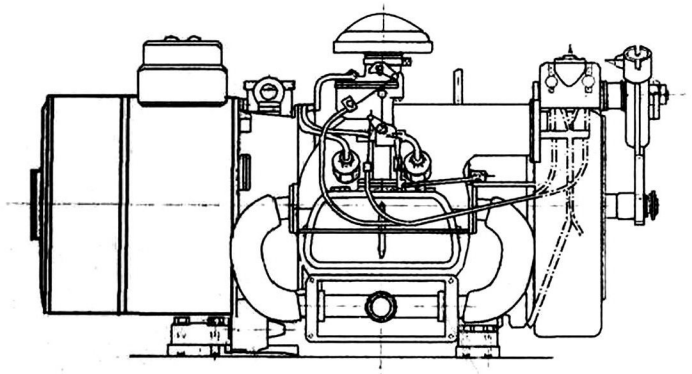
only possible way of achieving low-loss, large, variable-speed drives supplied with direct current. It can be charged intermittently without transmitting the load shocks to the electrical system.) The 48-Volt battery powers a 13-kW DC motor, which by way of a DC generator produces 330 Volts for the turret traverse motor (temporary output of 7.5 kW). Speed is influenced by a traverse regulator that has thirty-two resistance levels. In normal operation, the four 12-Volt batteries are also responsible for starting the 12-cylinder engine by way of the auxiliary generator (flange-mounted to the double generator). Above the batteries is the tool kit, and to the right of it another ammunition box for 128 mm or 75 mm ammunition. The switch on the left is a safety switch for a flap on the turret platform that prevents the turret from being traversed when an engine compartment door is open.



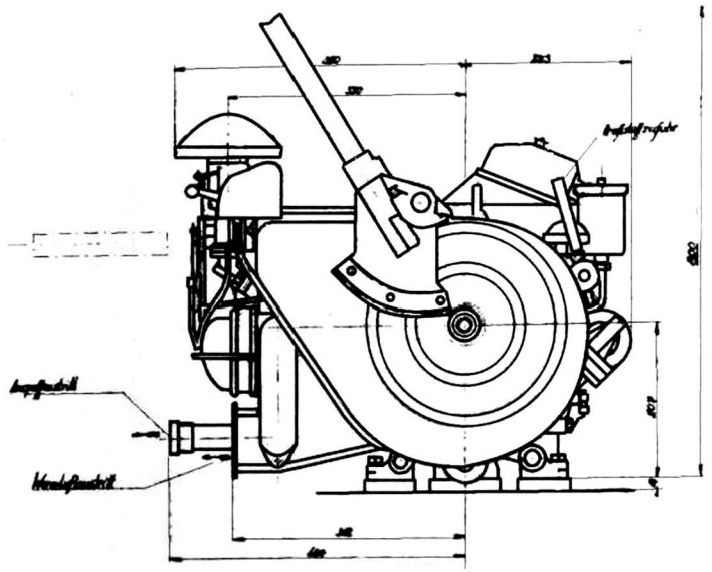
The left-side electric motor (wooden mock-up) with the two disc brake support plates (parking brake and emergency brake), plus the two oil filler necks for the reduction gear and planetary drives.



Rearward view toward the right-side electric motor (wooden mockup) and the 1,000 liter [264 gal] external fuel tank's fuel line (with predetermined break point).

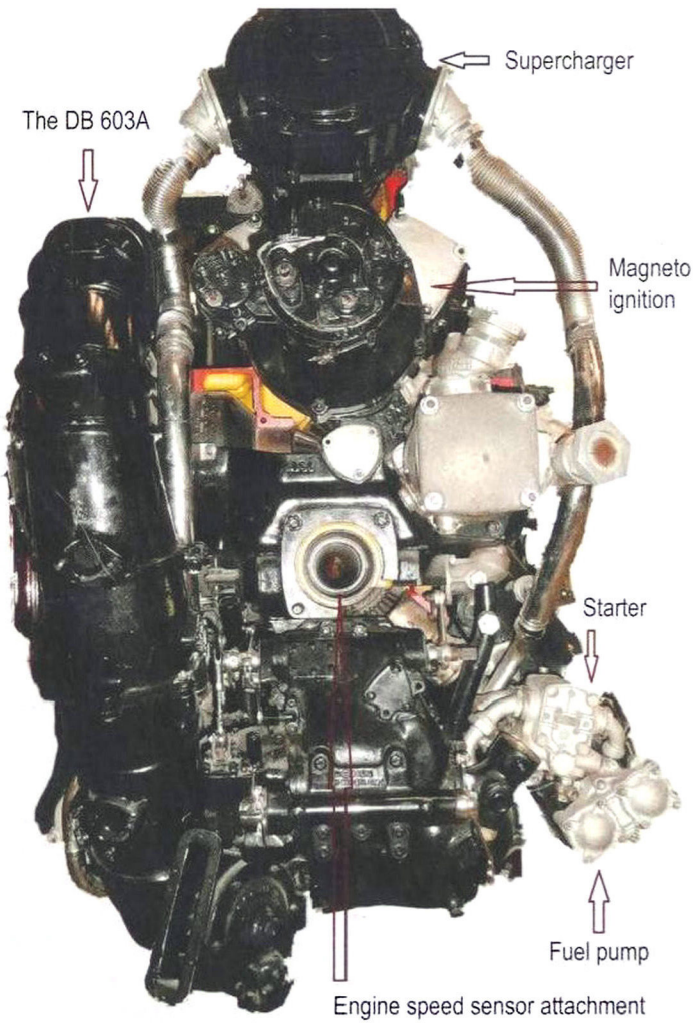


The Porsche Type 141 auxiliary power unit, in essence half a VW engine with a 5.5 kW generator.

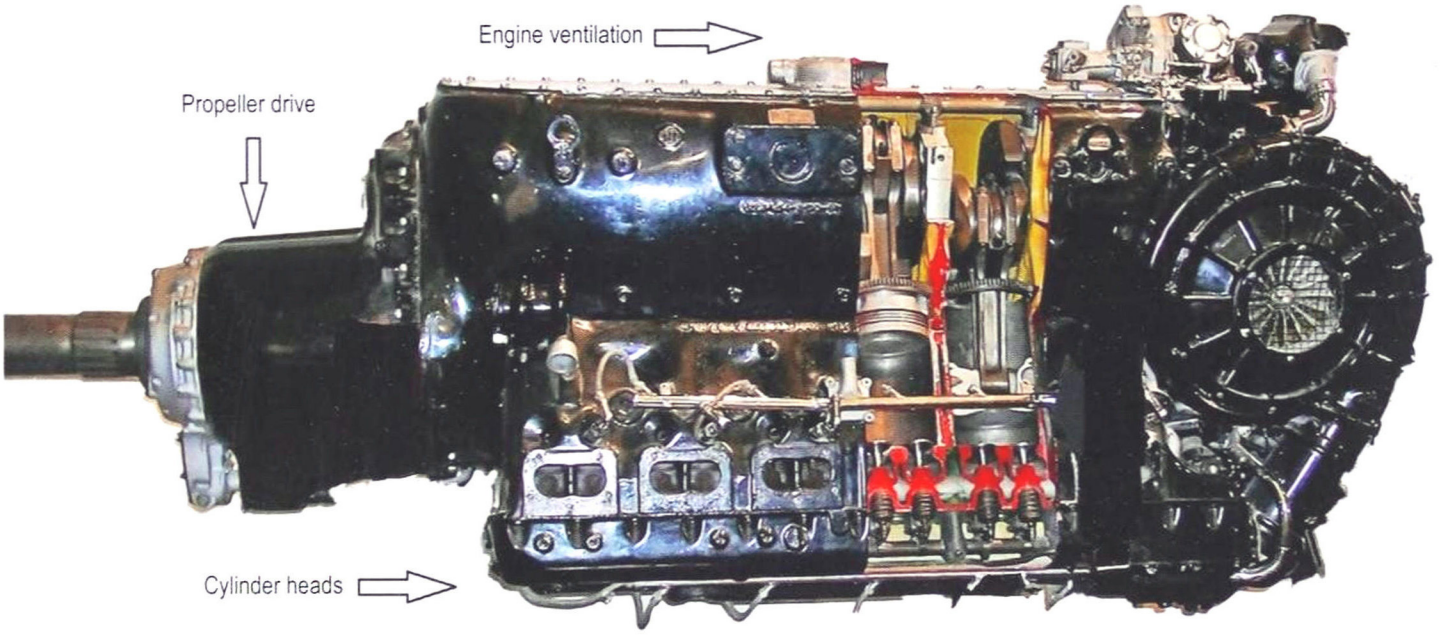


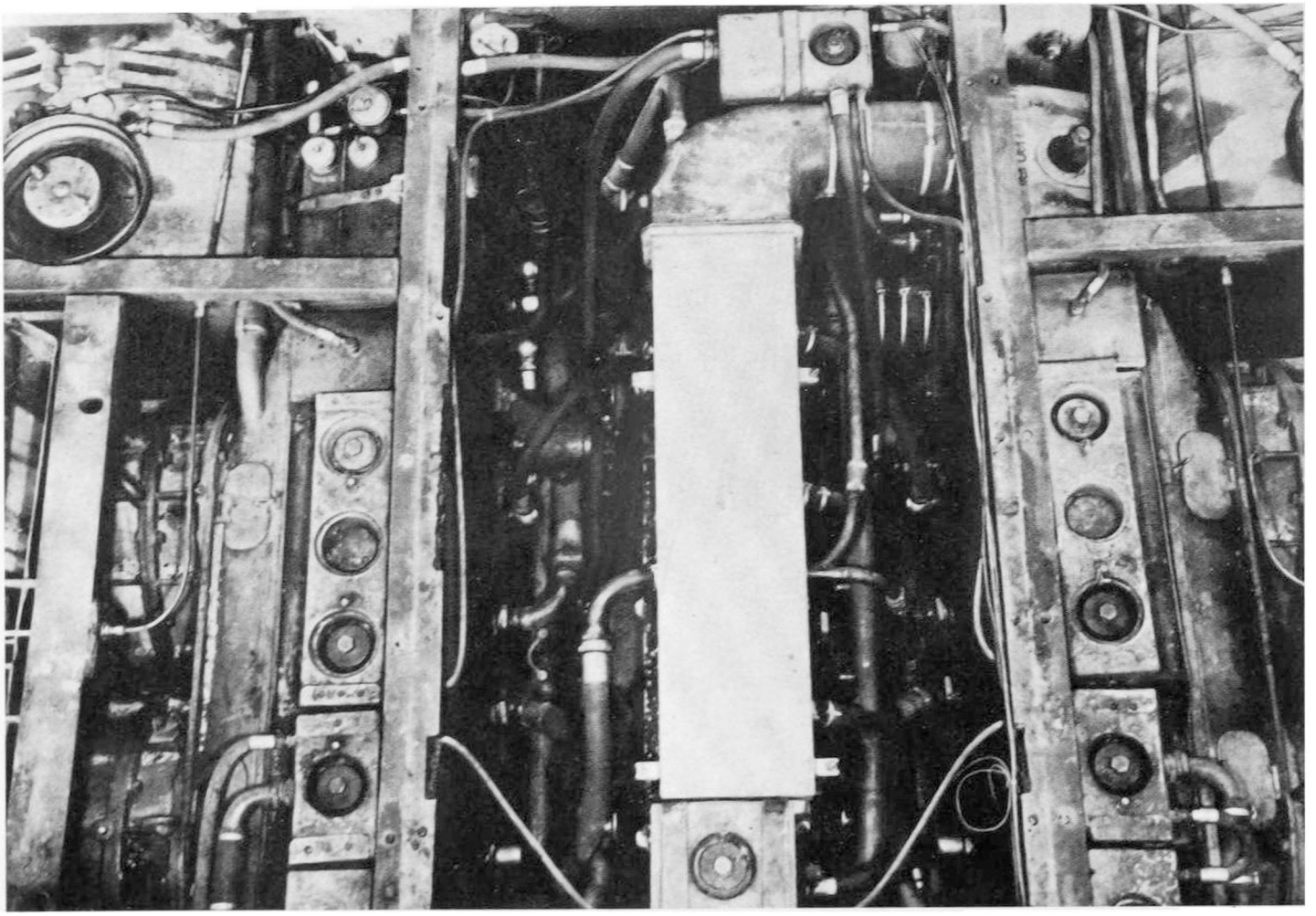
The MB 509 Gasoline Engine and the Cooling System

The power plant was created in 1943, from the well-known DB 603A aircraft engine. As an aircraft engine, the 12-cylinder fuel injected power plant had a continuous output of 1,375 hp. It had a displacement of 44,500 cubic centimeters. It was used in the Me 109, Me 410, He 219, Do 335, and Fw 190C. The engine had double ignition (two sparkplugs per cylinder) and had magneto ignition for the twenty-four sparkplugs. As well, the intake air was charged by a mechanically driven axial supercharger. To improve the pilot's field of view, the engine stood on its head so to speak. It was provided with a Riedel Viktoria RBA F10 two-stroke starter engine producing 10 hp. Performance was considered adequate, although its inverted configuration made intermediate gearing necessary, as the power from the crankshaft atop the engine had to be transmitted to the double generator on the bottom. The two fan drives also came from this gearing, which alone required



Hollow shaft for machine gun firing through the propeller

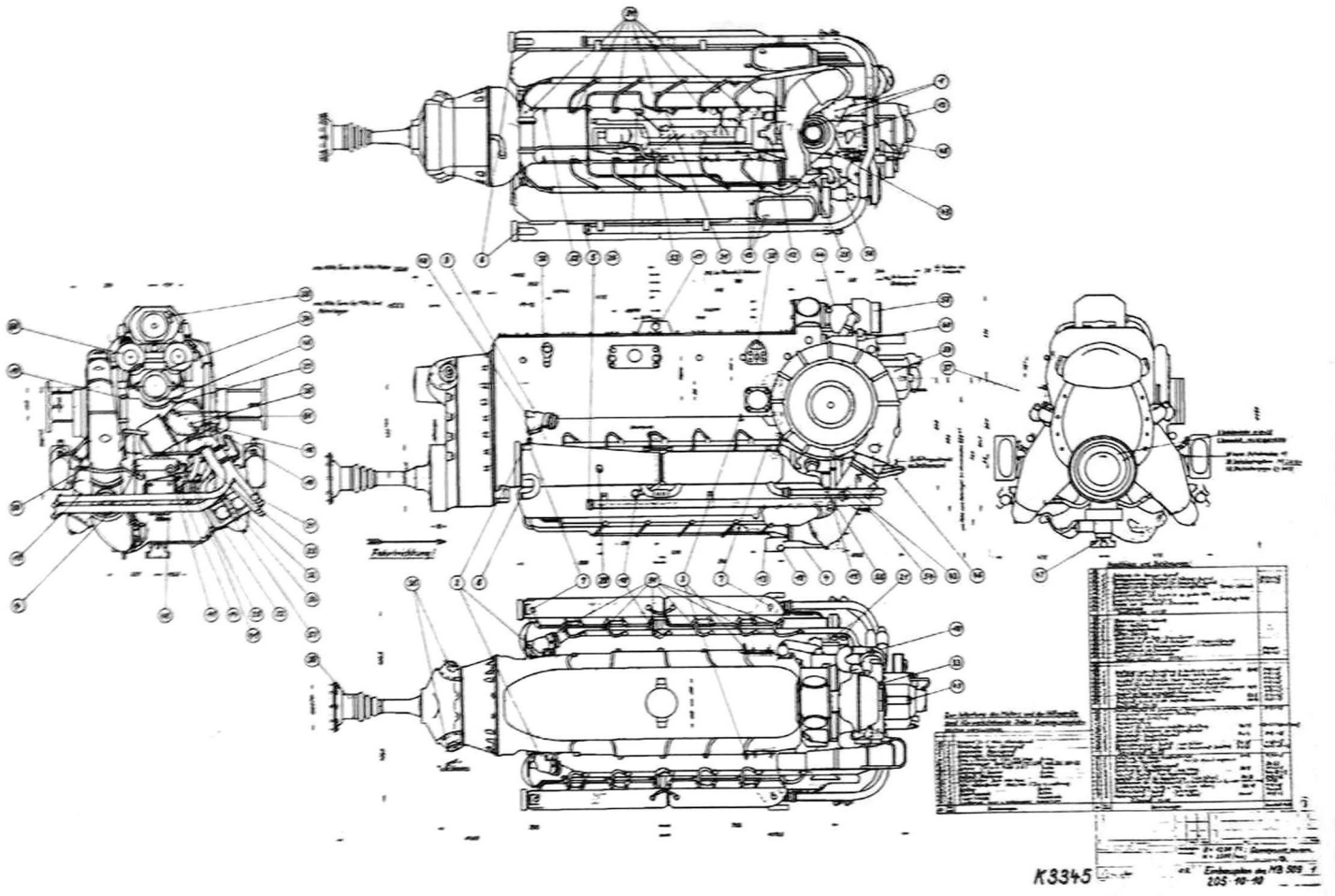


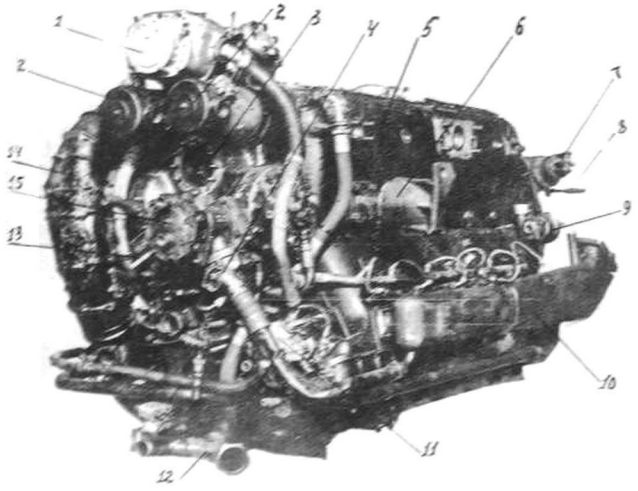


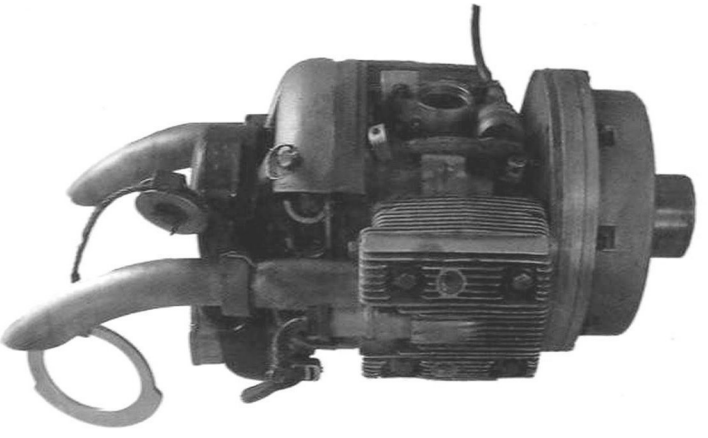
The MB 509 engine installed in Maus 205/1. Right and left are the engine and exhaust coolers. On the engine sits the air filter box. Above left and right are the gasoline tanks.

an output of 120 hp. During design work it was found that 87 OZ (the octane number) aviation fuel was not available in the army, so the engine had to be adapted for use of the army's lower octane 74 OZ fuel. Otherwise the engine would have been irreparably damaged by a tendency to knock. As a result, compression had to be reduced (from 1:7.5 left, 1:7.3 right to 1:5.9 left, 1:6.1 right). Different pistons were installed and supercharger compression was reduced to

1.225 atmospheres. This caused a drop in output to 1,292 hp. Nevertheless, with its ignition timing of 35° before top dead center, the engine operated close to the knocking limit. This apparently led to higher thermal loads on the sodium-filled exhaust valves because the minutes made mention of valve damage. Later, to achieve longer engine life, output was reduced again to 1,080 hp. That was all they needed. Because of this and its high fuel consumption, it was clearly no more than an interim solution. As an aero-engine it consumed 205 gal/psh of fuel at continuous power. Using lower-grade fuel, the converted MB 509 engine used 245 gal/psh.

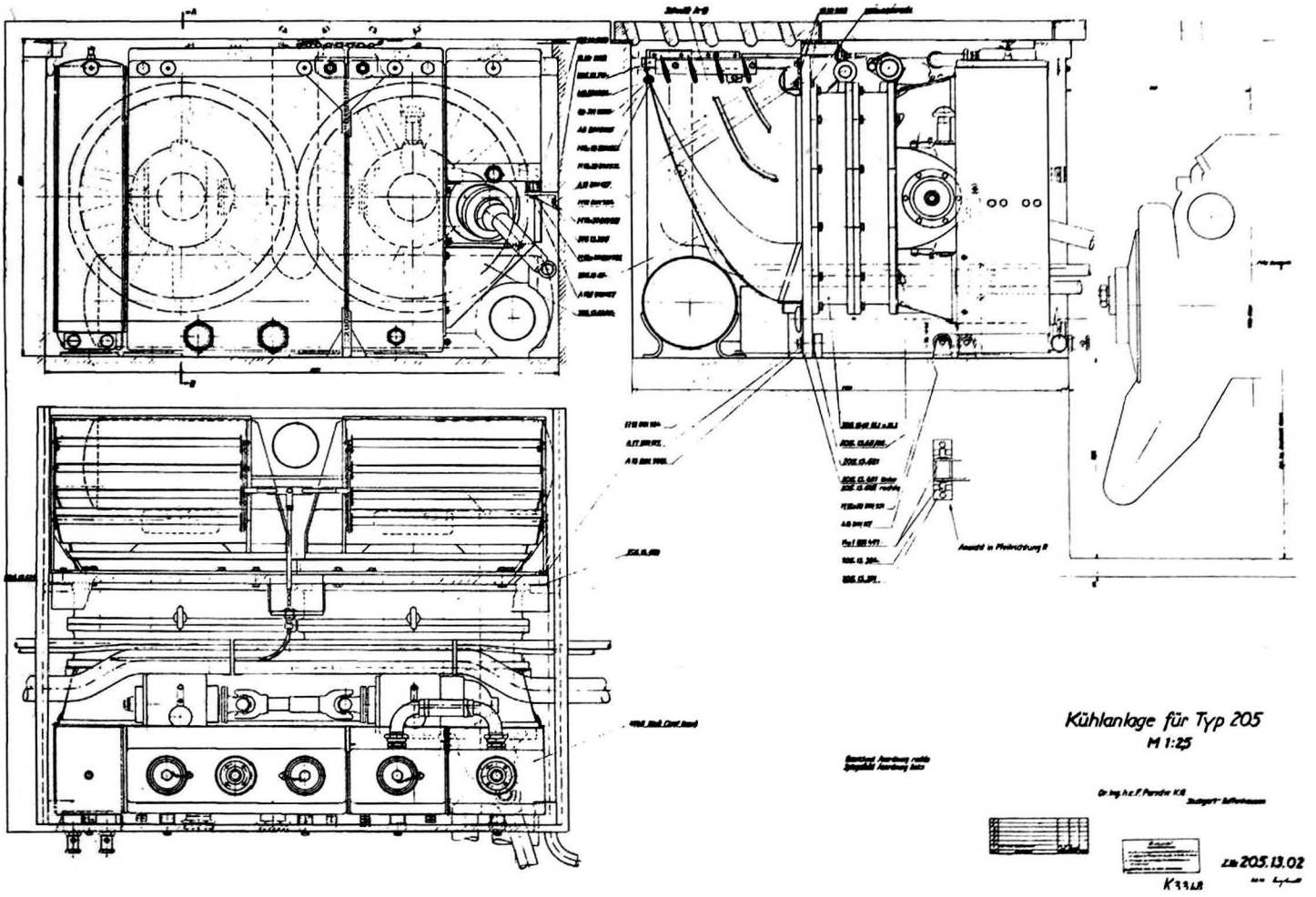




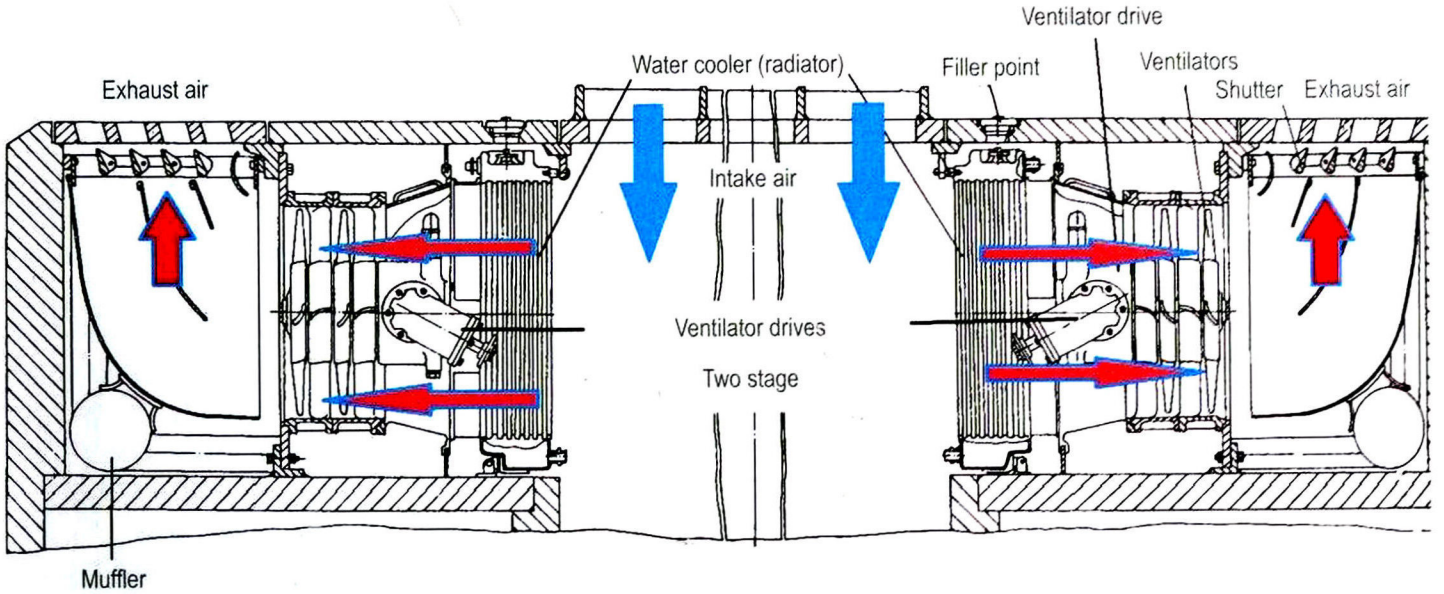


1 – Bosch ZM 12 R8 2 magneto ignition
2 – two 12 Volt alternators (for the 12 Volt net)
3 – Riedel starter engine connection (see photo right)
4 – additional water pump for exhaust cooling
5 – engine speed sensor
6 – Engine mount
7 – Lifting shaft drive shaft
8 – Ventilator linkage
9 – Air vapor separator
10 – Exhaust manifold
11 – ZD 1000B fuel pump
12 – Water pump for cooling system
14 – DB axial compressor
15 – Hydraulic pump

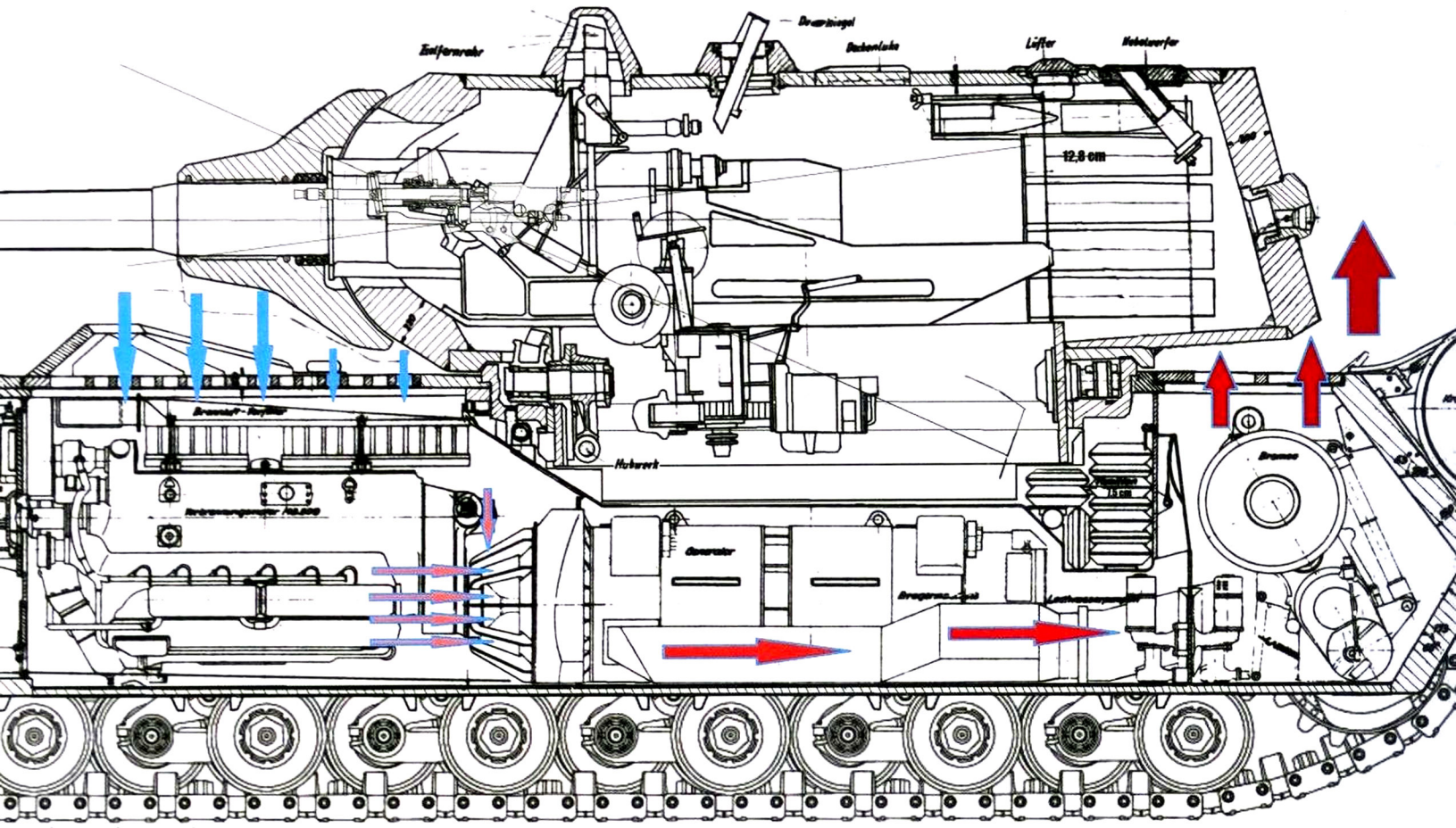
The Viktoria-Riedel starter engine was a ten horsepower twin-cylinder two-stroke engine. If the auxiliary generator failed to function, the engine was started electrically using the radio operator's 12 Volt net that by way of gearing started the 12 cylinder engine. It could also be started with a pull cord in an emergency. The Riedel engine was also used as a starter engine in the Jumo 004 and BMW 003 turbojet engines that were used to power the Me 262 jet fighter.



The ventilator drive and ventilation system and part of the engine cooling system.



Engine and exhaust cooling ventilation scheme. Depending on the rpm level, the ventilator drive drew between 120 and 148 horsepower.

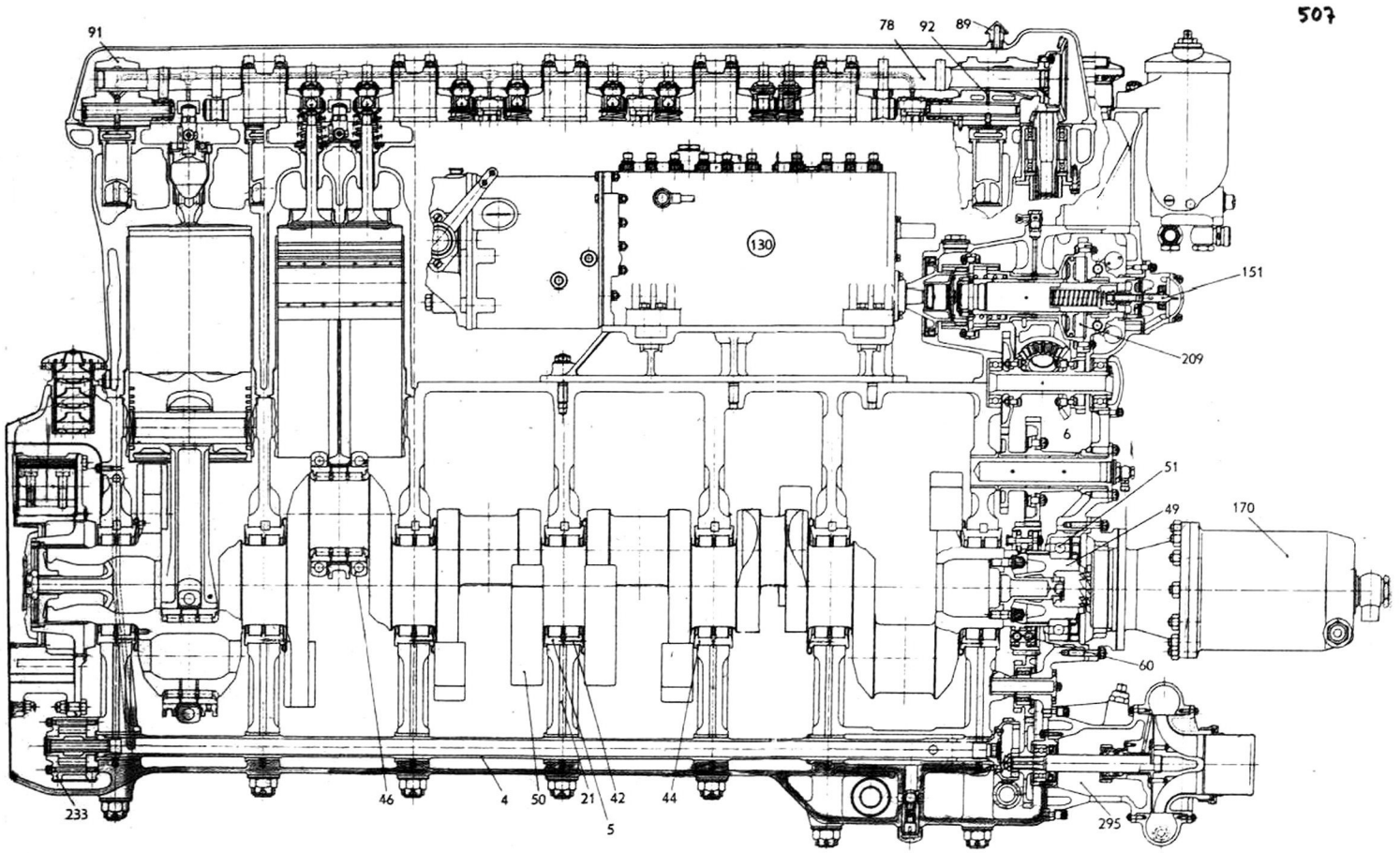


Drive accessories ventilation scheme. A fan wheel mounted on the front of the double generator drew fresh air through the center engine grating and directed it via two air ducts past the generators (left and right) to the brakes and reduction gear units. The warm air exited from the rear grating beneath the turret. The left- and right-side electric motors were cooled by the fighting compartment's ventilation system. Two openings in the bulkhead between the fighting compartment and the electric motor compartment were provided for this. This exhaust air exited through the two electric motor gratings beneath the turret.

The MB 517 Diesel Engine

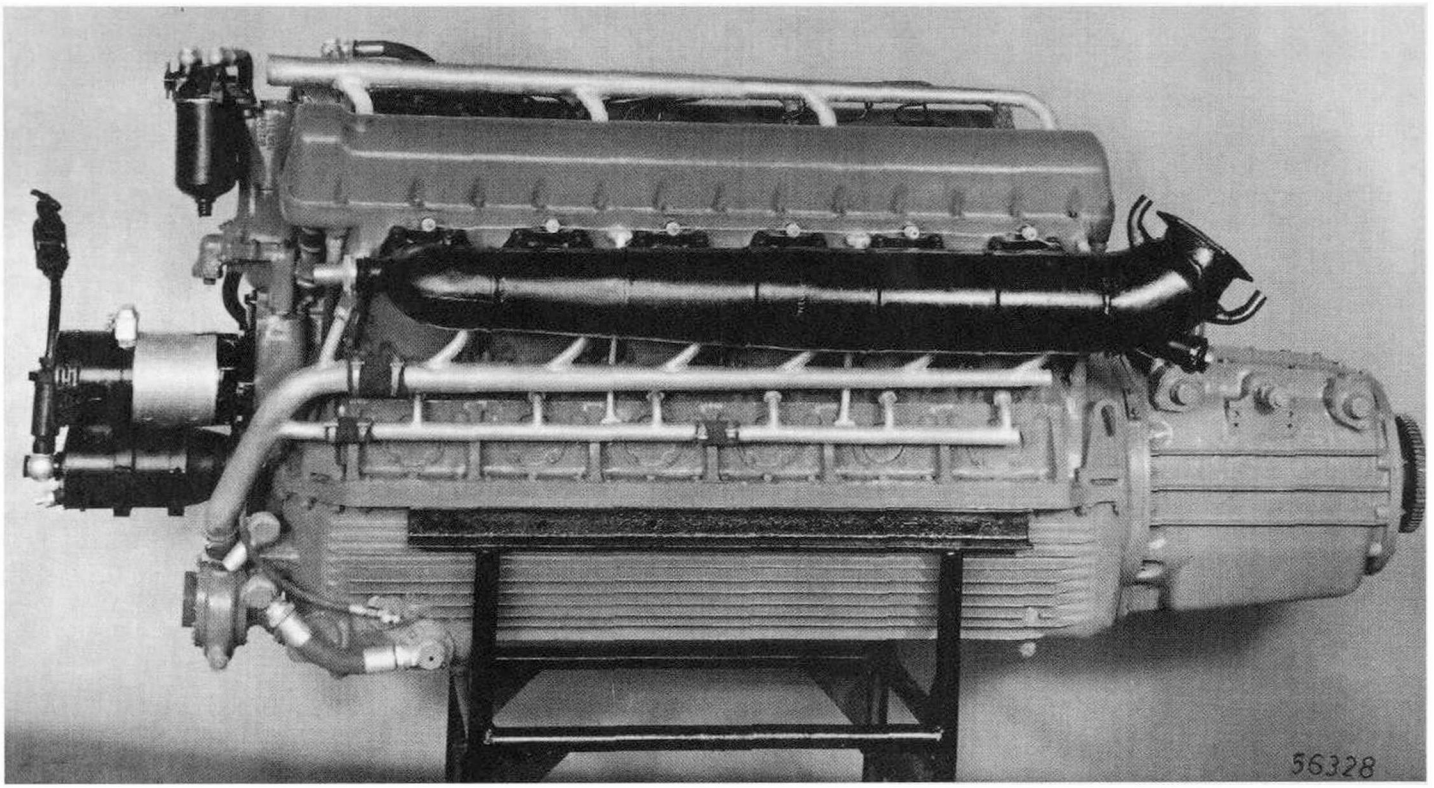
The MB 517 was derived from the MB 507 light diesel engine, which was developed for use in the navy's *Kleinst-Schnellboote* (smallest motor torpedo boats) beginning in 1940. A pair of engines together developed 1,100 shaft horsepower. Eight light Schnellboote were equipped with this power plant (LS 3–4, LS 7–18). In principle, the engine was identical to the DB 603 aero-engine, but it was installed upright. As befitted its origins as an aircraft power plant, the engine was very light. The MB 507 was a 12-cylinder 60° prechamber diesel engine. It was made entirely of Silumin-Gamma—an aluminum-silicon alloy—and had four valves per cylinder, with the exhaust valves sodium cooled. The overhead camshaft was driven by line shafts. Fork valves were used to achieve a compact design. There were three versions: Version A had a displacement of 42.3 liters [11.17 gals] and produced 1,850 hp; version B had a displacement of 44.1 liters [11.65 gals] and delivered 1,000 hp; and version C had the same displacement as version B, but was supercharged and delivered 1,200 hp. The MB 507 engine was also envisaged as a tank engine for Daimler-Benz's VK 3001 Panther project. The engine was also used to power six chassis of the "*Karl-Gerät*" (Karl Device), a 600 mm mortar. Experimental installations were also undertaken by MAN in late-production versions of the Panther. Because production of the engine was limited to one small batch (about thirty) and no other production capacity was available, the plan was dropped, even though it had a better weight-to-power ratio than the W 2 12-cylinder aluminum diesel engine used in the Soviet T-34. The DB 607 A was an inverted diesel engine derived from the DB 603 A in 1941. Its diesel injection system was adopted

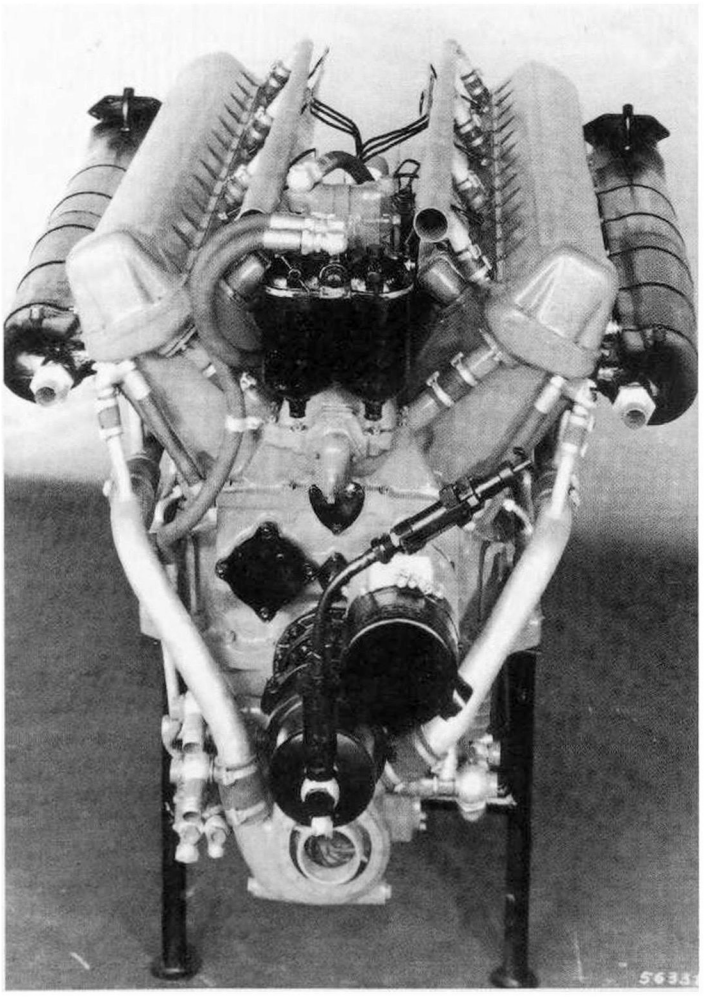
507

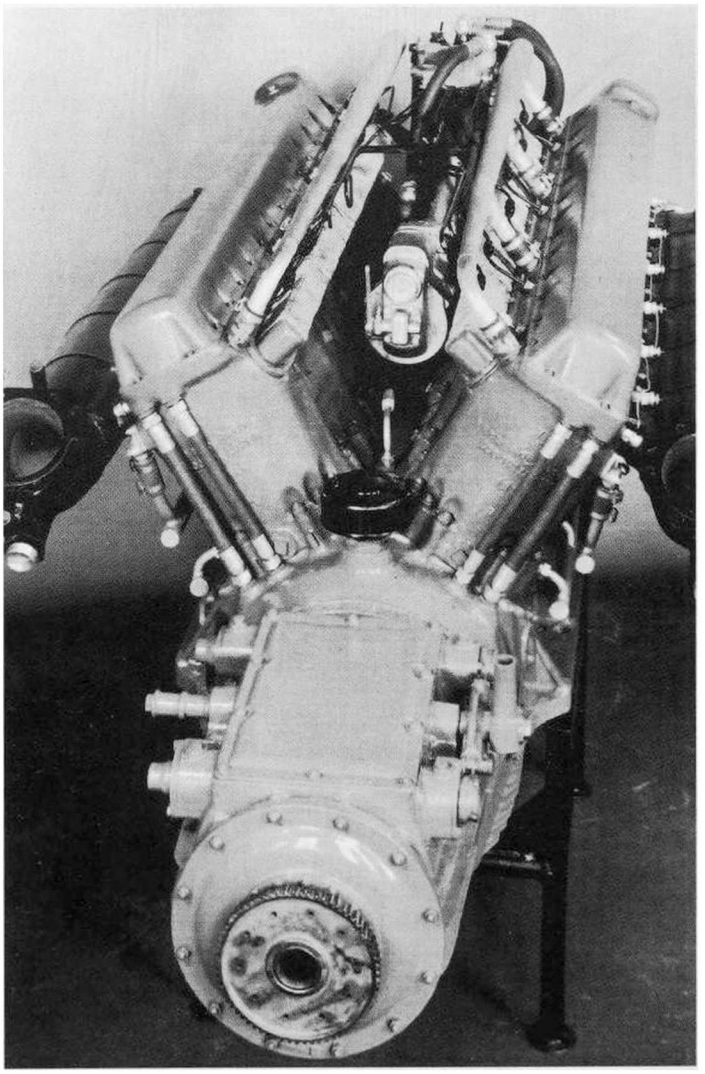


Engine longitudinal section	Primary dimensions
Number of cylinders	12
Bore	158 or 162 mm [6.22 or 6.38 in]
Stroke	180 mm [7.09 in]
Displacement	42.3 or 44.4 liters [11.17 or 11.73 gal]
Compression ratio	1 : 17
Overall height	1,045 mm [41 in]
Overall width without exhaust pipes	790 mm [31 in]
Overall length with starter	1,830 mm [72]
Power at 2,300 rpm	850 hp
Power at 2,400 rpm	1,000 hp
Power with supercharging	1,200 hp
Empty weight	820 kg [1,808 lbs]

for the MB 507. Equipped with a Hirth exhaust-driven turbosupercharger, the fourth prototype produced 1,750 hp at 2,500 rpm. The engine was extremely economical and consumed 175 gal/psh of fuel at maximum power. Compared to the 245 gal/psh of the MB 509 this was a considerable difference. The MB 517 was structurally identical, but was not inverted. Daimler-Benz offered this engine with a mechanical supercharger that gave the engine an output of 1,200 hp. It also had a displacement of 44.4 liters [11.73 gals]. Weight was only about 820 kg [1,808 lb.]. The engine was thus well suited to the Maus. Professor Porsche was annoyed the engine had not been offered to him earlier. Consequently,

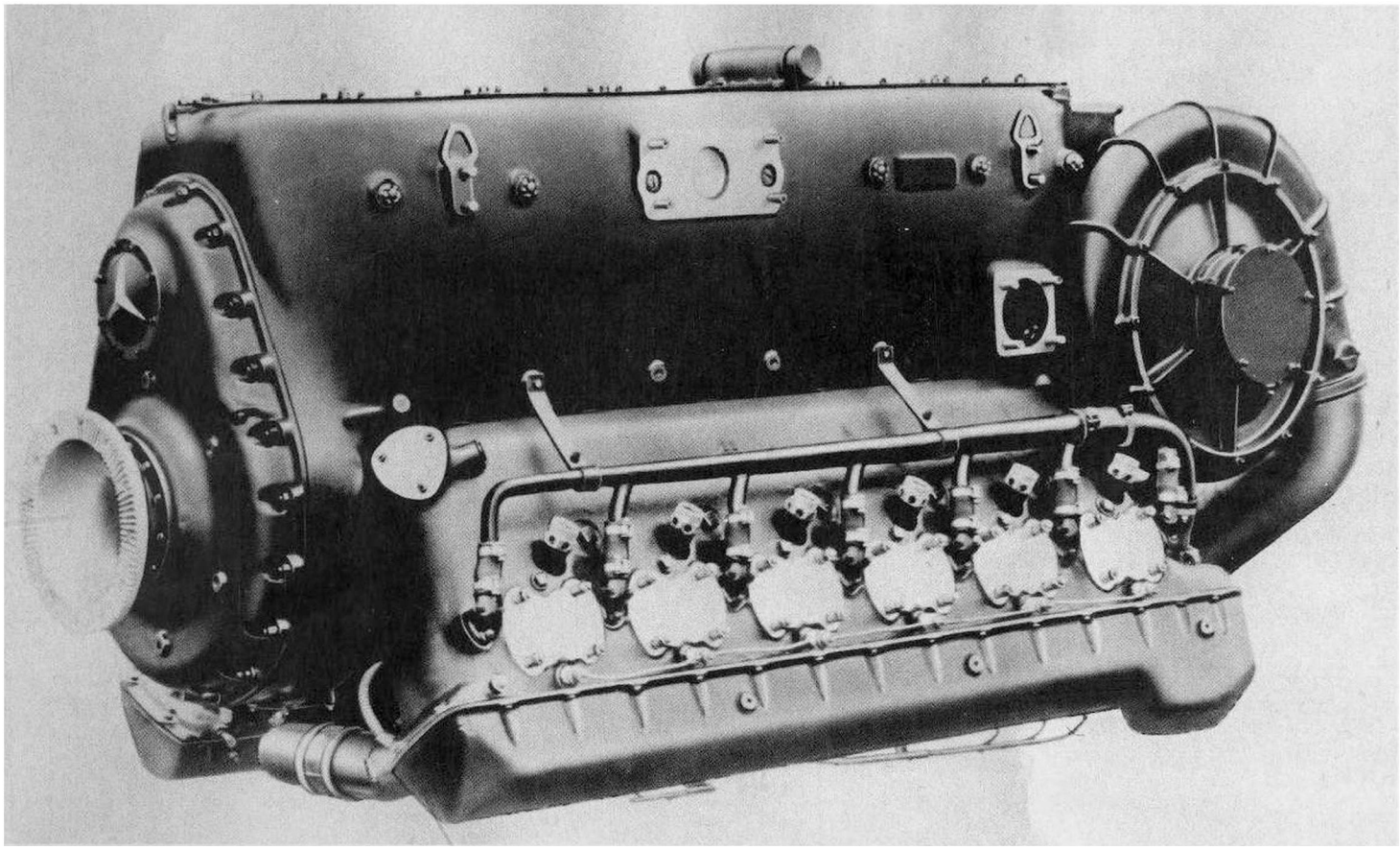




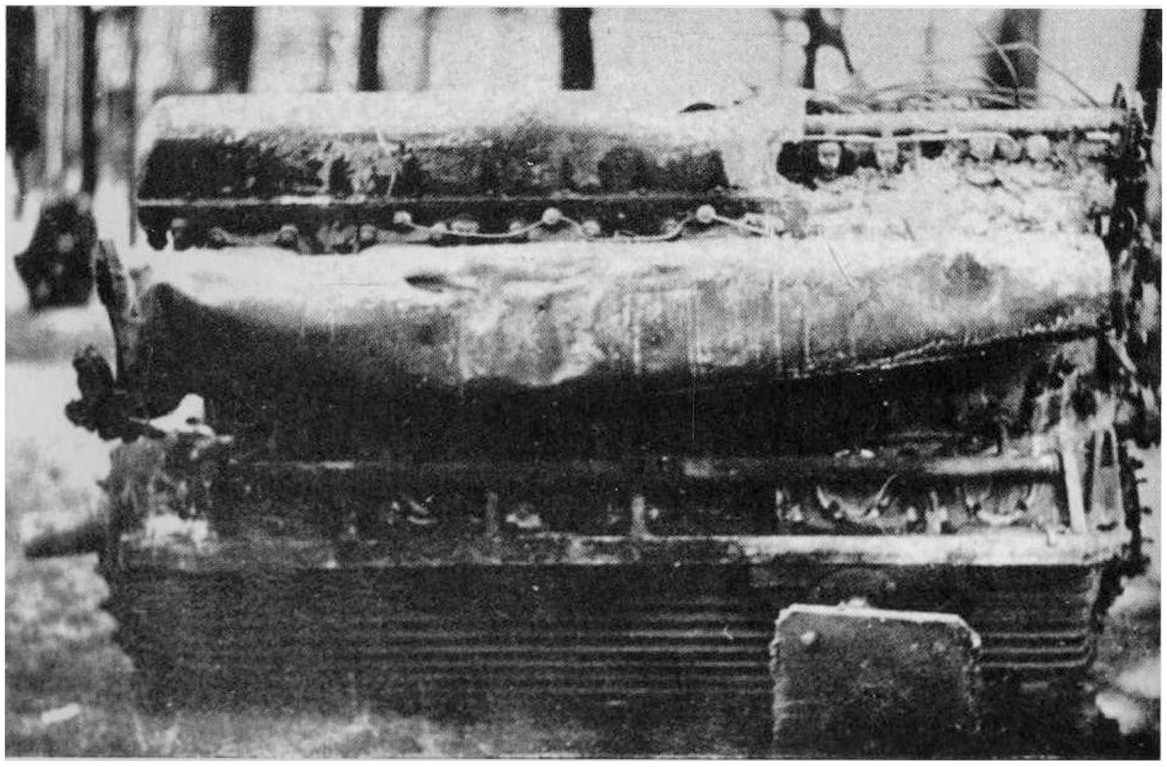


The MB 507 marine engine with marine reversing gear units. In the lower photo, the fuel filter is on the upper left, beneath it the alternator, then the starter, and below it the water pump. The Bosch injection pump is between the cylinder banks.

just two examples of the MB 517 were completed. One was still at Daimler-Benz in December 1944 and cost 125,000 RM. As the first engine was wrecked because of defective installation in late October 1944, the second available engine was installed later (in Kummersdorf-Gut in March 1945, according to the Porsche biography). The figures above show it was much more economical than the MB 509.



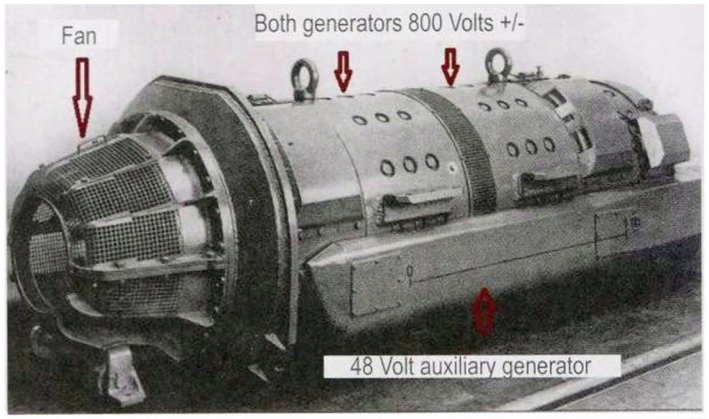
DB 607A diesel engine.

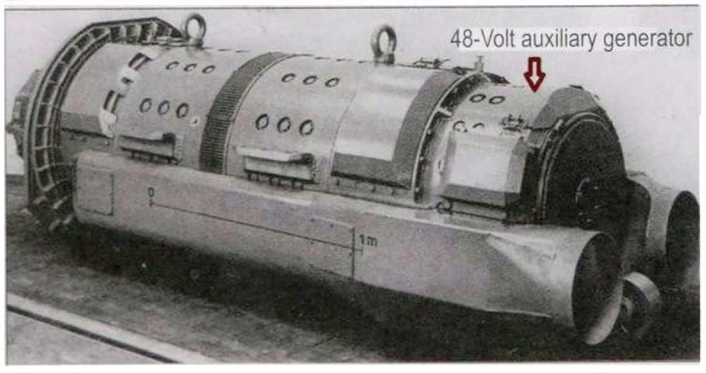


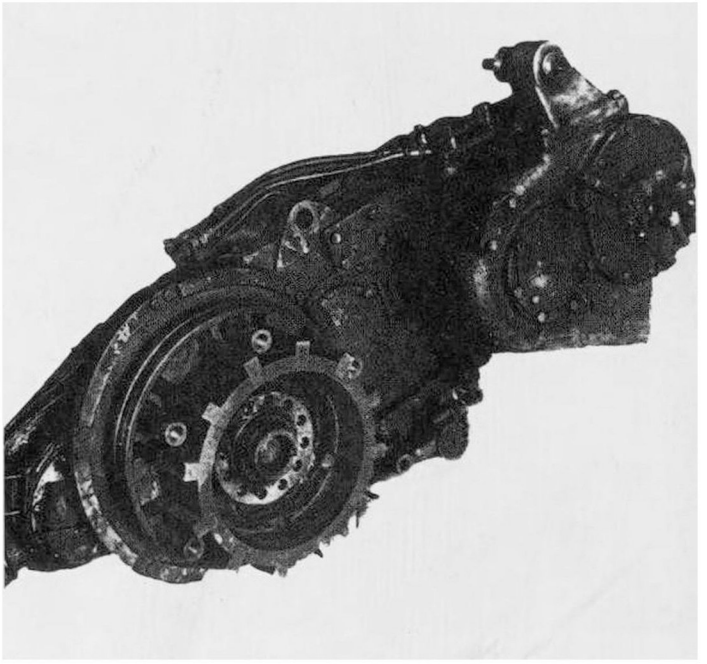
The wrecked engine photo taken at former Hindenburg Square in Wünsdorf in April 1945 is the only known image of an MB 517. It shows the right side, with the exhaust manifold badly dented; the direct drive to the double generator is on the left. The mechanical supercharger is on the other side. The valve cover, engine block, and the forward accessories have been destroyed and the Riedel starter engine is torn off. Probable cause is a demolition charge installed from the driver's position.

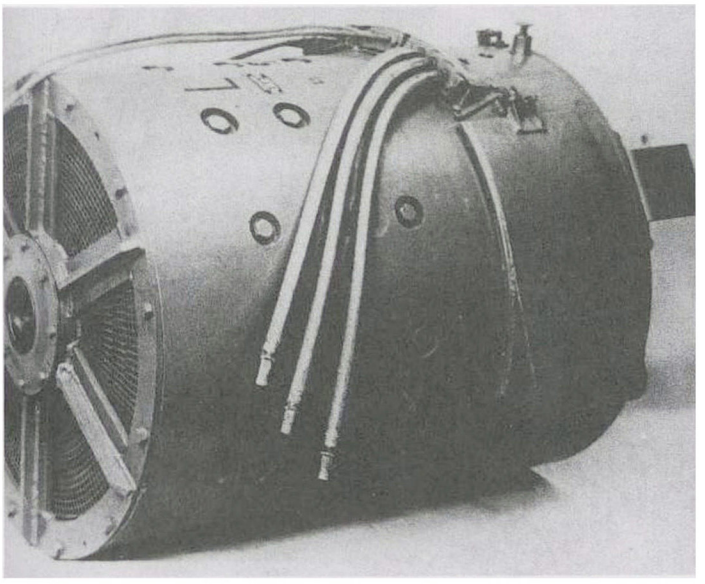
The Drive

The MB 509 twelve-cylinder gasoline engine drove the electricity generating double generator via the angular gearbox. The angular gearbox was done away with on the MB 517 diesel engine, which was flange-mounted directly to the generator. Like most electrical components, the generator was made by Siemens-Schuckert of Berlin. It was designated the LK 1000/12-2000 double generator and produced 800 Volts of direct current with 400 kW of power. It was also three-part and fan-cooled. The third member of the group was the 48 Volt auxiliary power unit. Its job was to start the engine (in normal operation) and charge the 48 Volt battery set in the turret space. The double generator weighed 3,885 kg [8,565 lb.]. One electric motor produced 40 kW at 3,100 rpm at 800 Volts direct current. The Siemens-Schuckert motor was six-pole, with interpoles and compensating turns. One motor weighed 1,875 kg [4,134 lb.]. The two electric motors were mounted in the rear, left, and right, and a spur-type transmission gearing powered the drive wheels by way of a safety clutch and torsion shaft (to protect against hard jolts in the transmission of power). This had a gear brake and a low range gear shift that allowed the gear ratio between the electric motor and the track drive wheel to be varied from 1 : 25.44 to 1 : 48.68. There was thus almost twice as much power in low gear. Two planetary drives took care of further transmission of power. The planetary drives raised the entire gear ratio once again. They were driven by quick-release axles that could be removed from outside. As on the electric motors, these axles were torsion shafts (or torsion rods) that were supposed to absorb shocks.









Siemens-Schuckert electric motor

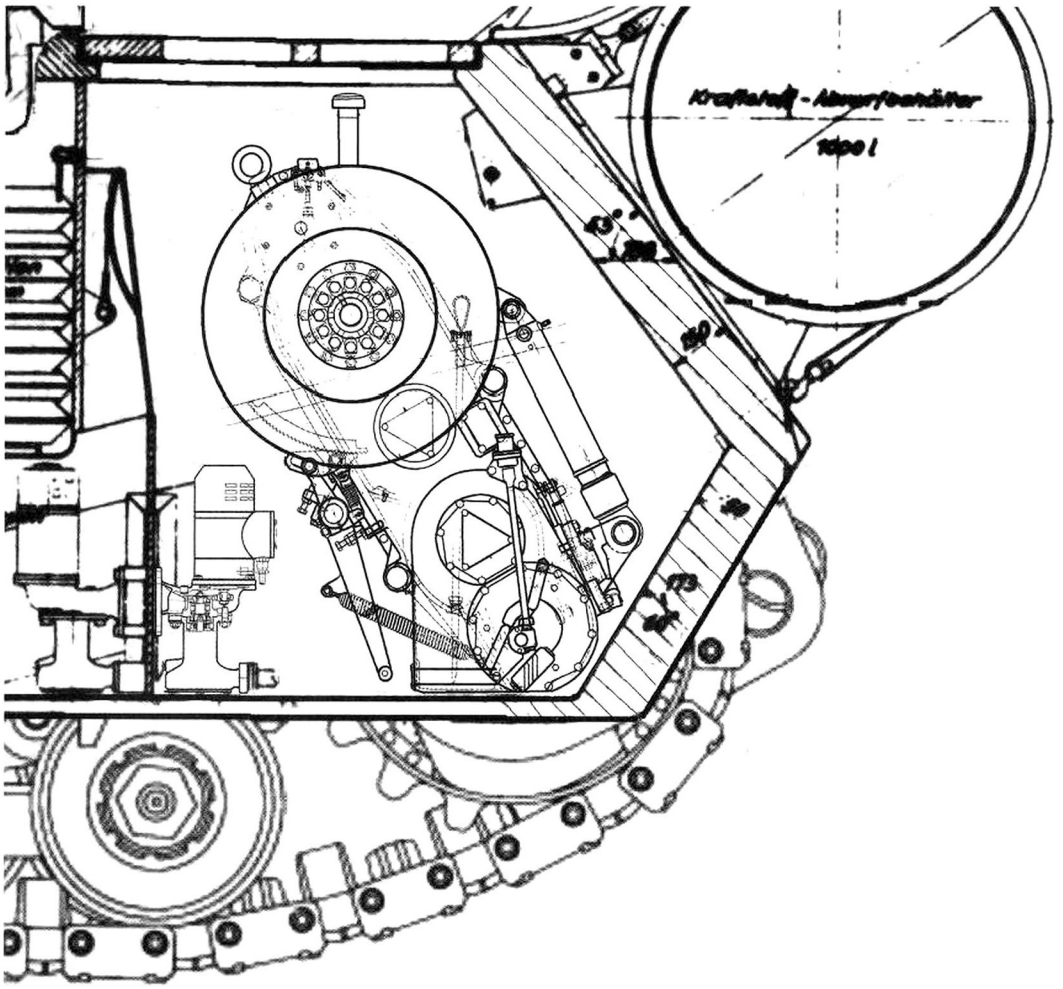
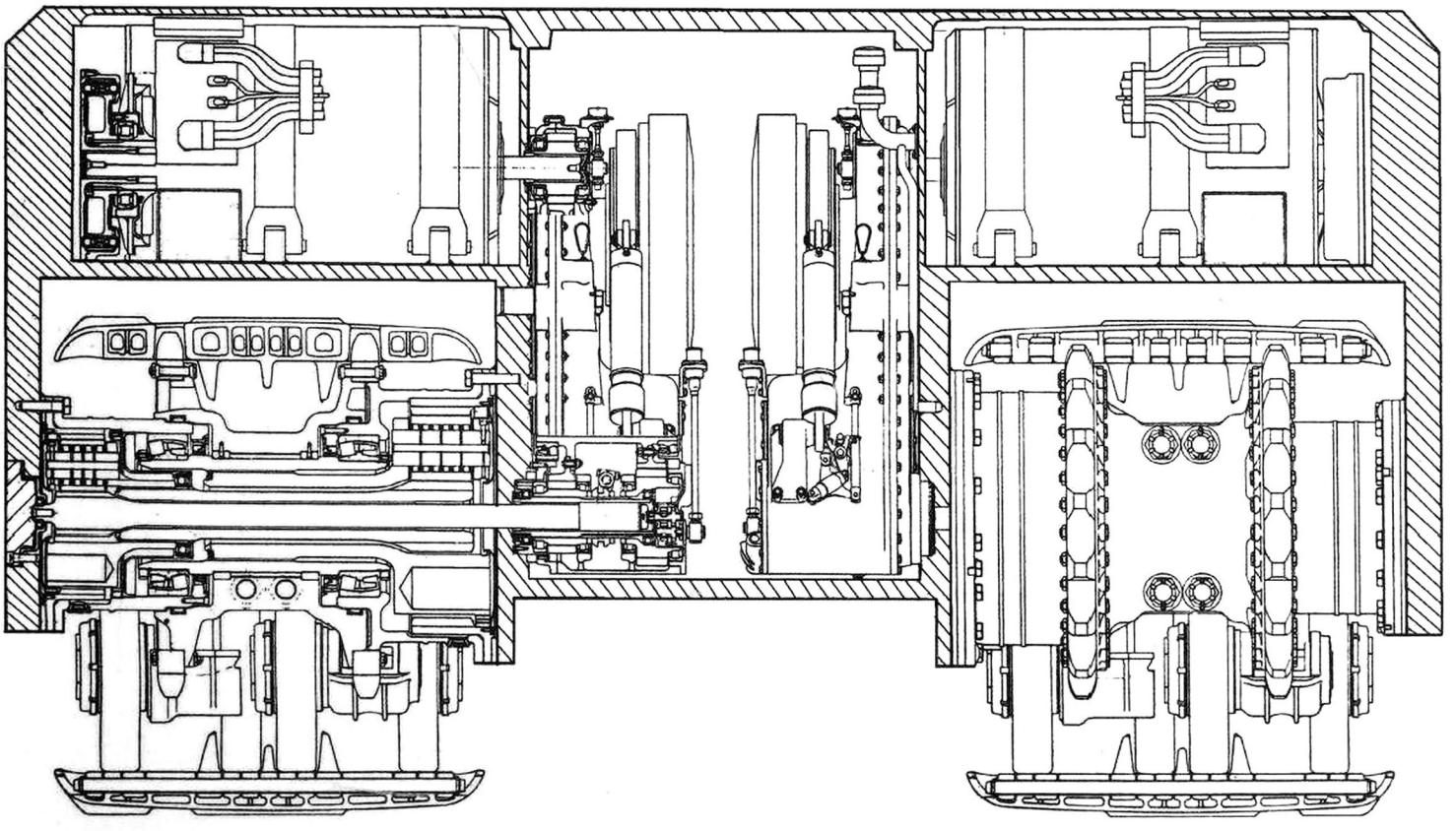


Diagram of the two different track links. The track links were joined by connector links with track bolts.

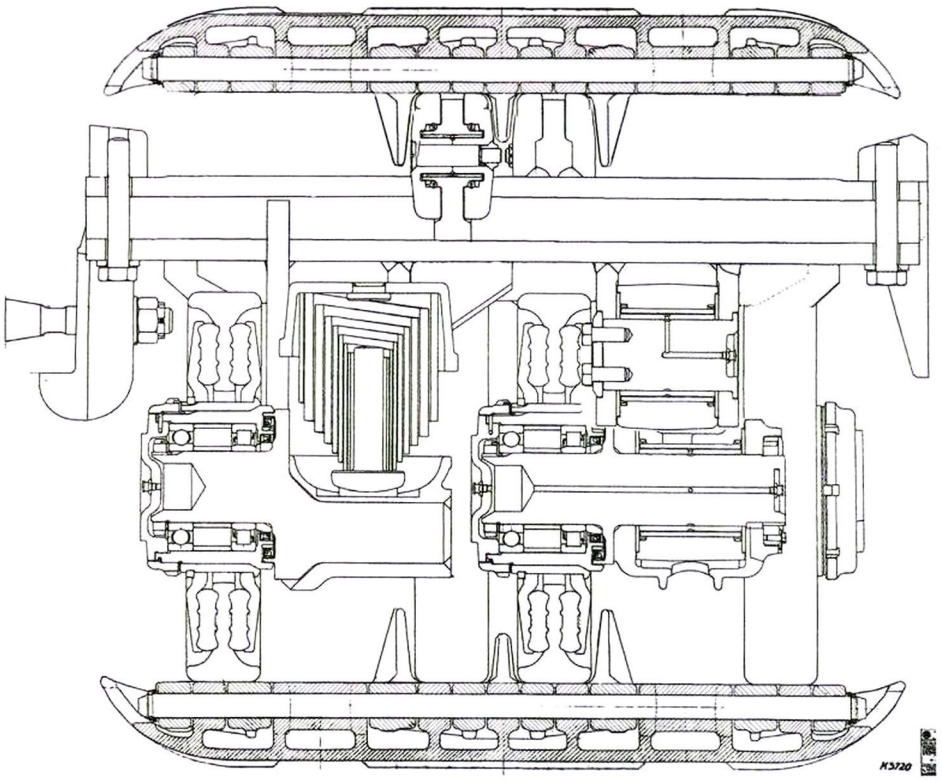


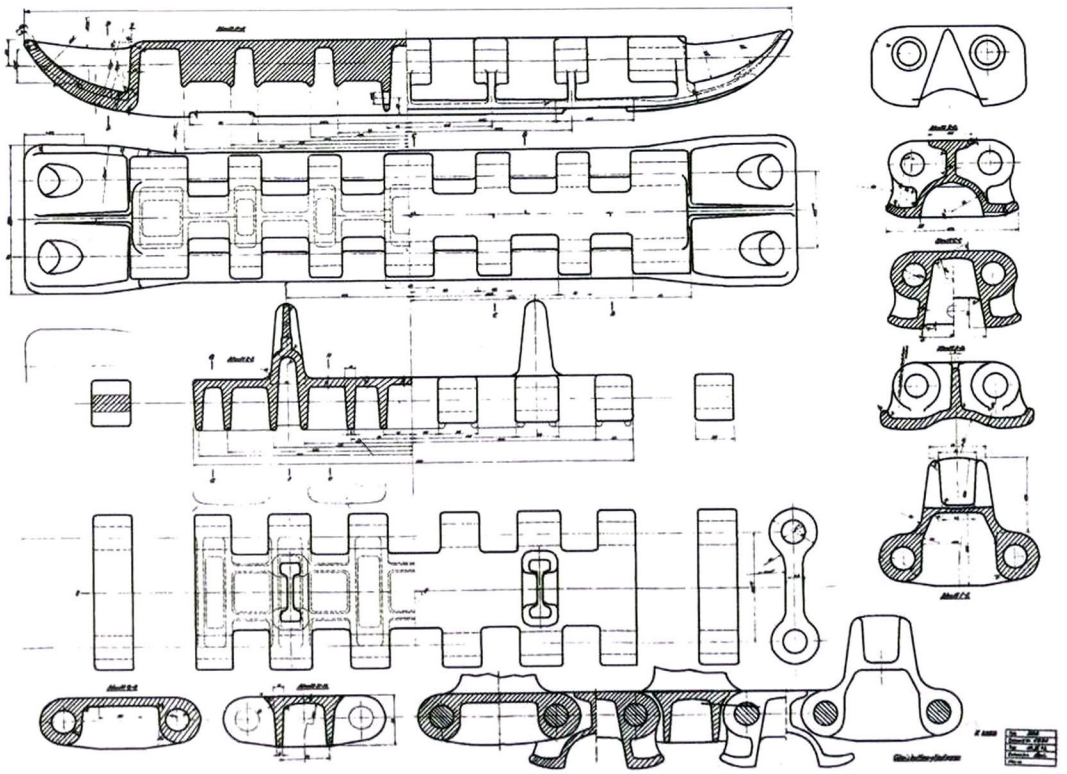
The drive compartment with two spur-type transmission gears and mechanical disc brakes. One of the three drainage pumps was also in this area.

Other Tank Components

Brakes

The brakes were only auxiliary brakes. Each consisted of one disc brake per track and was flange-mounted on the transmission gearing. The brake was self-adjusting, and as a foot brake was actuated hydraulically by two brake pedals. For use as a parking brake it was actuated mechanically by a cable and two handbrake levers. In normal use braking was electric; the electric motors ceased to drive, instead functioning as generators and created resistance that slowed the vehicle. In the process, the two generators again became electric motors that powered the auxiliary power unit to charge the battery set and used the friction of the gasoline engine to reduce speed.





Armor Plate

Maus Armor Plates Materials Table of 12 July 1943

Hull 1 (Hull 2) Forward Section 1/3	Steel Type	Plate Thickness (mm)	Tensile Strength (kg/mm²)	Carbon C %	Manganese Mn %	Silicon Si %	Chromium Cr %	Molybdenum Mo %	Nickel Ni %	Vanadium V %	Ph + S %
Front wall	PP 8182	104/103	105/104	0.37	0.45	0.30	2.16	0.22	0.61		0.03
Bow floor bottom	Wh n/A	205/204	84/78	0.33/0.34	0.35/0.47	0.22/0.30	2.34/2.40	0.19/0.37	3.07/3.15		0.03
Bow wall top	Wh n/A	204	78	0.34	0.47	0.30	2.40	0.37	3.15		0.03
Sidewall inner	FMC 35 G	84/82	90/100	0.40/0.39	0.72/0.66	0.50/0.26	1.83/1.81	0.08/0.09	0.50/0.78	0.15/0.10	0.02
Sidewall outer	Wh n/A	183/186	78	0.34	0.47	0.30	2.40	0.37	3.15		0.03
Sidewall outer	Wh n/A	183	83/76	0.30/0.33	0.39/0.36	0.27/0.23	2.3/2.41	0.31/0.20	3.22/3.09		0.02
Underbeam	PPM 8350 G	42	110/104	0.40	0.75	0.31	1.35	0.11	1.53	0.11	0.03
Underbeam	PPM 8350 G	42	107/104	0.42/0.40	0.82/0.75	0.32/0.31	1.28/1.33	0.12/0.11	1.48/1.53	0.13/0.11	0.03
Bow cover sheet	PP 8182	103	105/104	0.37	0.45	0.30	2.16	0.22	0.61		0.03
Turret shell		**mm**	**kg/mm2**	**C**	**Mn**	**Si**	**Cr**	**Mo**	**Ni**	**V**	**P + S**
Front wall	Wh n/A	236	83	0.3	0.39	0.27	2.30	0.31	3.22		0.023
Right sidewall	Wh n/A	205	82	0.34	0.27	0.2	2.37	0.21	3.35		0.012
Left sidewall	Wh n/A	205	76	0.33	0.36	0.23	2.41	0.2	3.09		0.025
Rear wall	Wh n/A	204	82	0.34	0.27	0.2	2.37	0.21	3.33		0.012
Roof panel	FMC 35 G	62	95	0.41	0.8	0.25	1.87	0.08	0.64	0.16	0.021
Floor panel	FMC 35 G	92	95	0.41	0.8	0.25	1.87	0.08	0.64	0.16	0.021
Floor panel 2	St 52	62	56	0.19	1.27	0.52	0.25		0.18		0.057
Gun mantlet Special Grade	Panzerguss A cast armor PP 7590		Notch Toughness				2.30		2.40		
128-mm KwK 44	3RStNiV 75	Full Pipe							1.64	0.19	0.01

Maus Armor Plate Materials Strength

Material	Thickness	Fiber	Yield Strength	Tensile Strength	Stretch	Cut	Notch Toughness	Ball impression hardness
Hull Wotan hard Wh/ nSA Front	200 mm	K.L.	63.2	79.6	24.3	69	29.8	
		G.					16.2	
		F.L.	60.1	77.4	22.7	67	29.2	
Side (right – left)	180 mm	K.L.	63.2–61.5	79.6–76	24.3–23	69–70	29.8–30.4	
		G.					24.4	
		F.L.	60.1	77.4–76	22.7–23	67–70	29.2–28.9	
Turret Shell Wh/nSA Front Wall	ca. 230 mm	K.L.	66.9	83.6	23.7	69	27.5	
		G.					20.4	
		F.L.	67.2	82.2	22.7	69	28.6	
Side (right – left)	200 mm	K.L.	62.8 –61.5	82.2–76	23.5–23	68–70	30.4–34.6	
		G.						
		F.L.	62.8 –60.7	80.5–76	22.5–23	63–70	28.2–28.9	
PP 8182 o Floor front	100 m	K.L.						105
		F.L.						103
FMC 35 G Side inner	80 mm	K.L.	89	97	18	62	24	103
		F.L.	95	103	15	59	19	109
FMC 35 G Turret roof	60 mm	K.L.	89	97	20	59	16	93
		F.L.	85	93	20	61	19	89
PP M 8350 G Underbeam	40 mm	K.L.	103	107	16	53	13	106
		F.L.	106	113	15	51	13	113
St 52 Turret floor	60 mm	K.L.	37	56	34	64		
		F.L.	35	55	29	61		

F - fiber L - lamellar K - crystal structure G - transverse

In comparison Ferdinand StuK 43/1

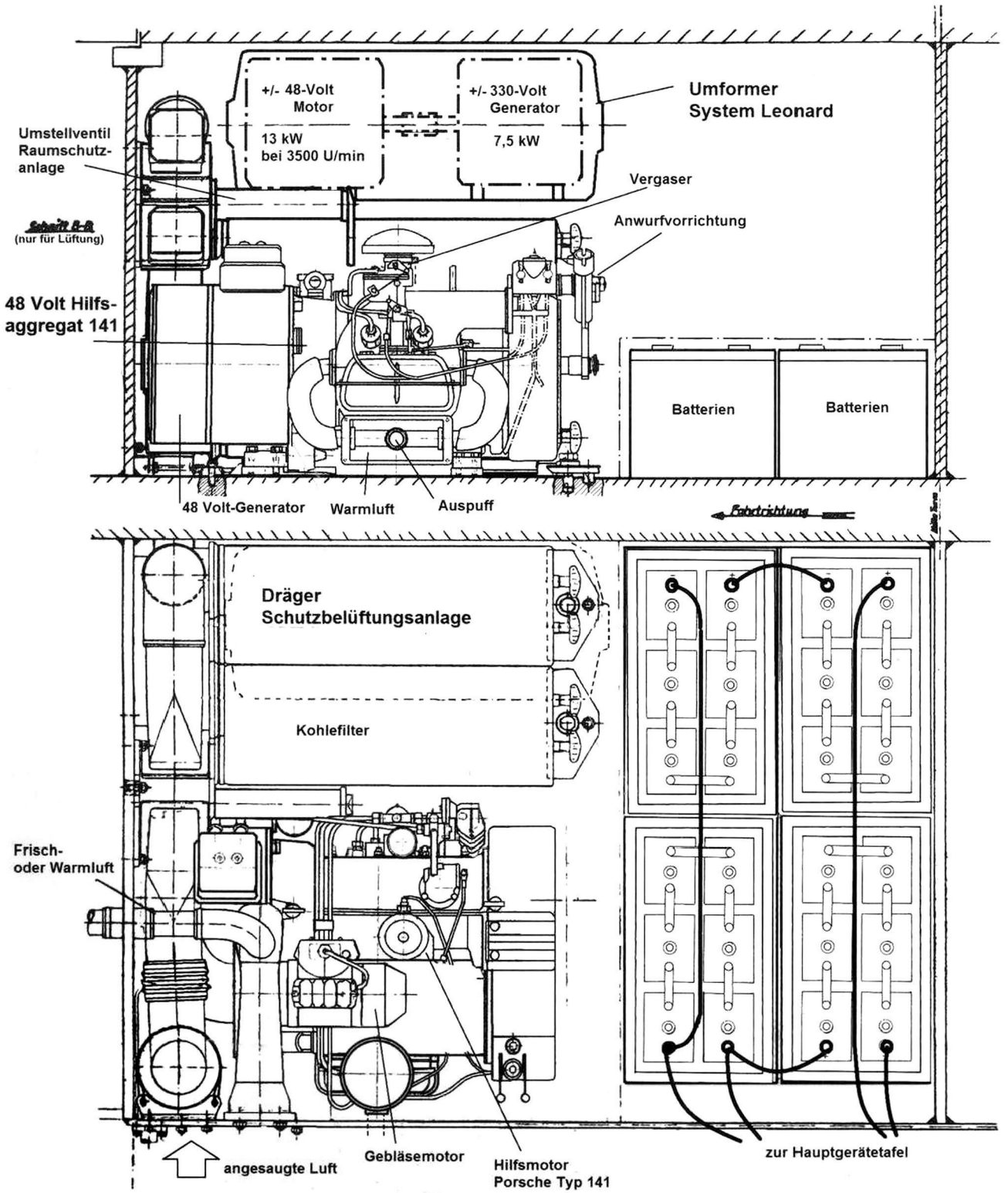
	Grade	Thickness	Tensile Strength	C	Mn	Si	Cr	Mo	Ni	V	P + S
Turret shell											
Front wall	PP 7690	204 mm	74 kg/mm2	0.36%	0.37%	0.34%	2.30%	0.12%	2.73%	0.00%	0.29%
Sidewall left	E 22	83 mm	92 kg/mm2	0.38%	0.70%	0.33%	1.71%	0.11%	0.80%	0.15%	0.21%
Sidewall right	E 22	85 mm	94 kg/mm2	0.38%	0.70%	0.33%	1.71%	0.11%	0.80%	0.15%	0.21%
Rear wall	E 22	84 mm	97 kg/mm2	0.40%	0.74%	0.38%	1.79%	0.11%	0.57%	0.13%	0.21%
Roof	E 32	32 mm	116 kg/mm2	0.41%	0.81%	0.50%	1.45%	0.09%	1.61%	0.10%	0.31%

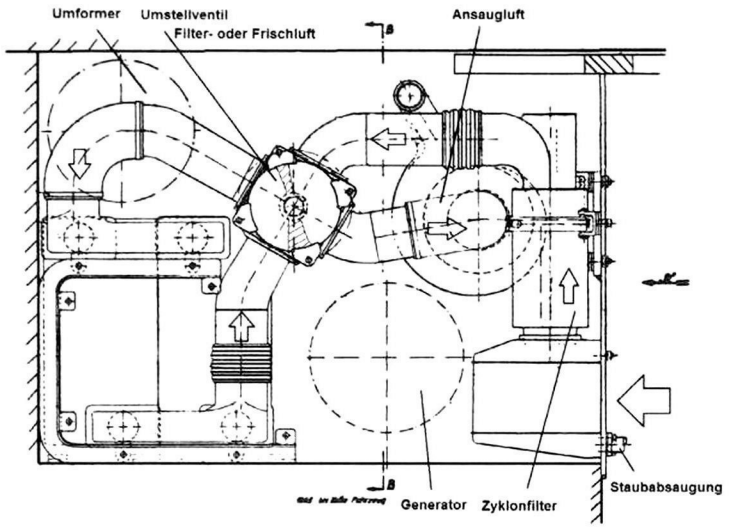
Other German armor steels

	Type	Break limit	Tensile strength	C	Mn	Si	Cr	Mo	Ni	V	P + S
Krupp Old Type	Armor Steel			0.37%	0.30%		1.89%		4.10%		
Krupp New Type	Pz.St. 420	70–80 kg/mm2		0.34%	0.31%		2.06%		3.79%		
Krupp Armor Steel	cemented										
Wotan Hard New Type	Wh n/A		75–85 kg/mm2	0.40%	0.73%	0.37%	2.08%			0.08%	0.02%
Wotan Soft New Type	Ww n/A		65–75 kg/mm2								

Ventilation System

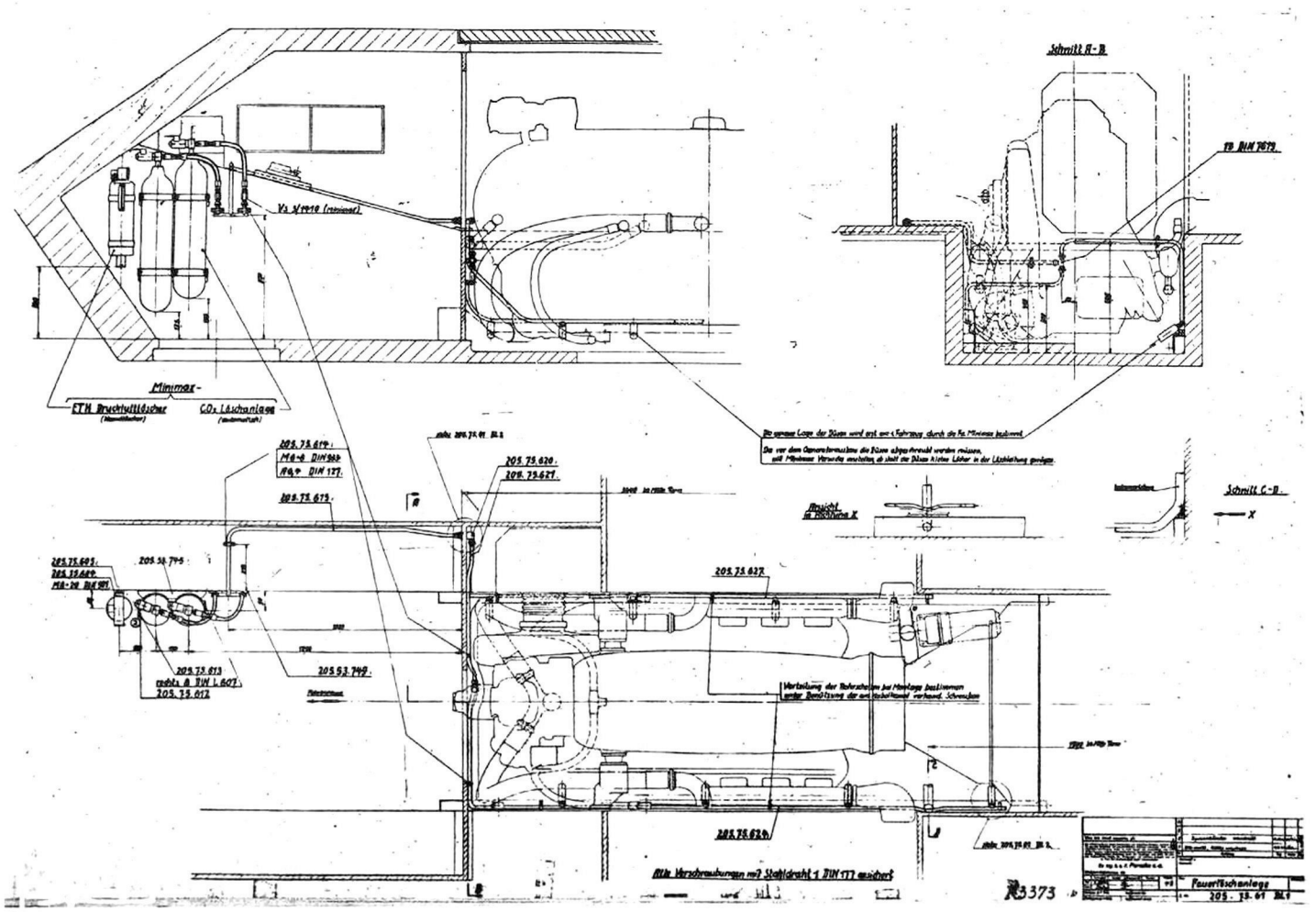
The tank had a ventilation system for the driver/radio operator compartment and the fighting compartment. The first six vehicles (prototypes) were supposed to receive a Dräger pressurized compartment system. This system had already been tested in a Panther tank. Its purpose was to provide the interior spaces with purified air and obviate the need for the crew to don oxygen masks in a gas attack. In addition to cleaning the air with two carbon filters, overpressure was produced in the crew compartments, preventing gas and dust from entering. It also reduced the potential for leaks when traveling underwater. The crew compartment was heated by a 48-Volt heating coil. In contrast to the Panther, the fan was powered by an electric motor instead of a V-belt. The air passed from the generator space through a dust filter (zyklon filter) to the fan. A suction ventilator blew out the dust from the zyklon filter through a radiator exhaust opening. A switching system allowed the crew to select fresh or filtered air.

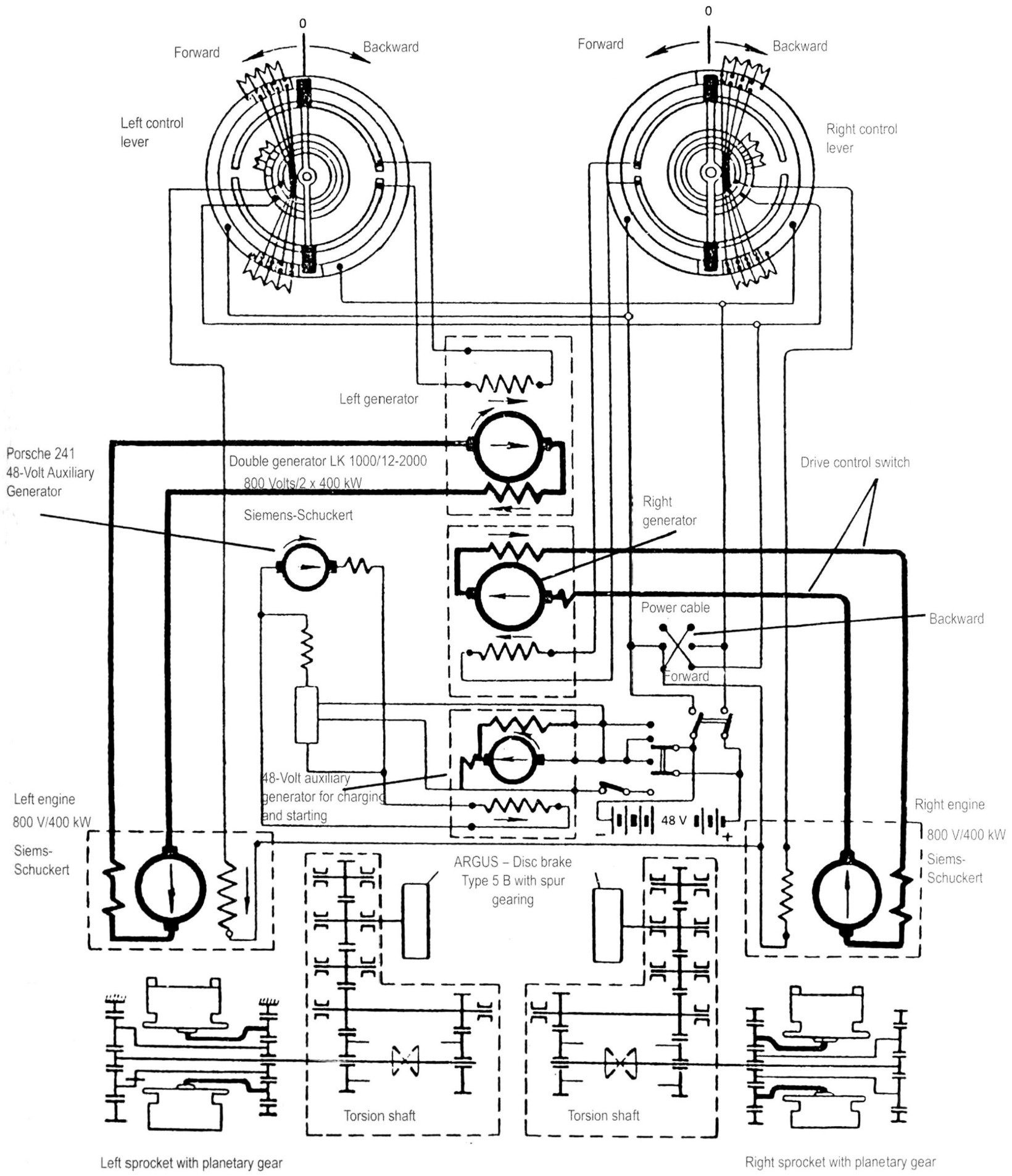




Fire Extinguishing System

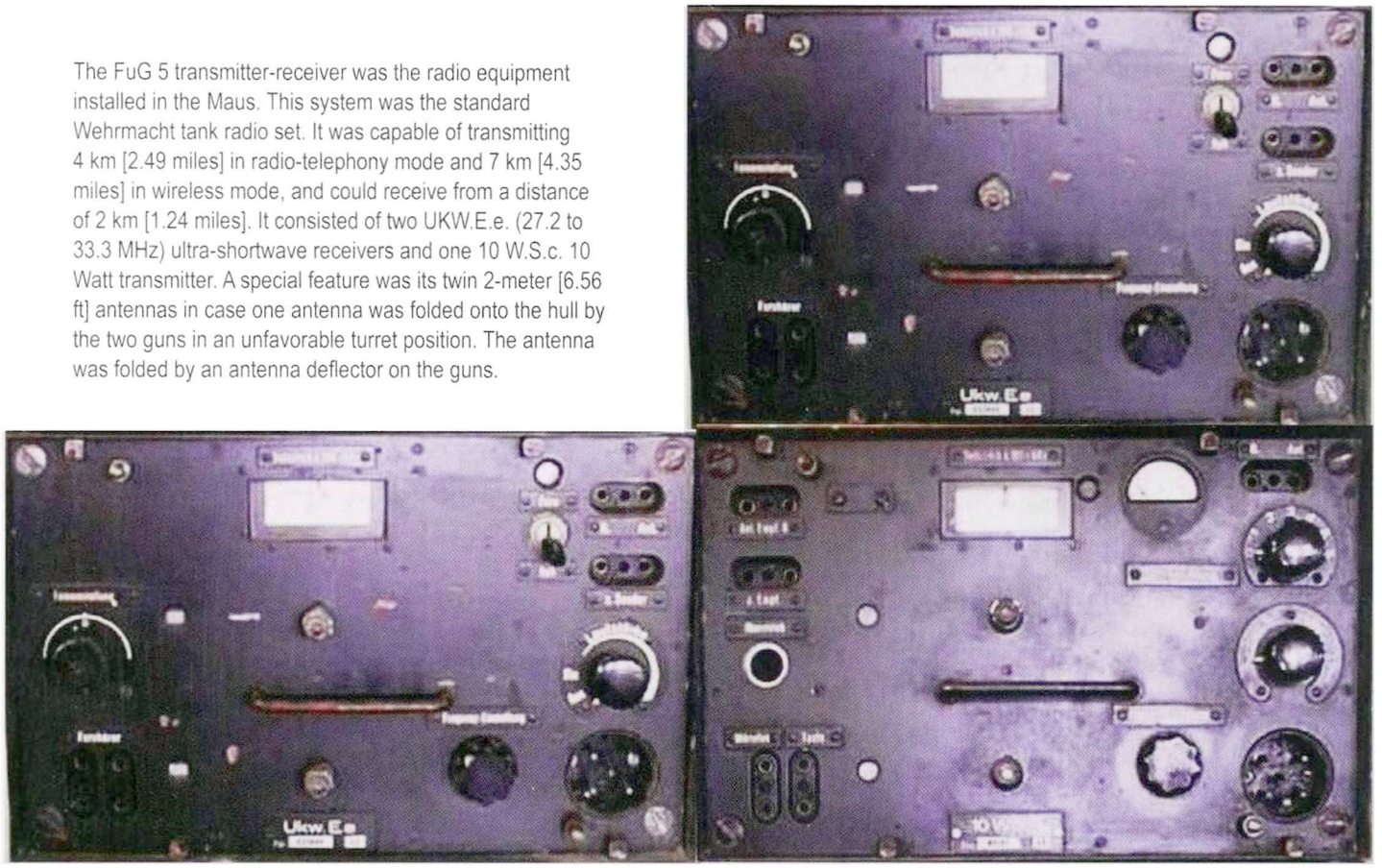
The Maus had an automatic fire extinguishing system made by Minimax that enabled the crew to extinguish a fire in the engine compartment with carbon dioxide. In the event of fire, one of the twelve bimetallic contacts was triggered when the temperature exceeded 160ºC. This contact operated an electromagnetic valve and in a matter of seconds, six kilos [13.2 lb.] of carbon dioxide were injected into the engine compartment, extinguishing the fire. Six kilos [13.2 lb.] of carbon dioxide were equal to 3,000 liters [792.5 gals] of free carbon dioxide gas. After the first bottle was completely emptied the warning light in the radio operator's position went out and the second carbon dioxide bottle had to be selected. The warning light showed the system's response and only went out after a corresponding heat sensor had cooled. By the warning light was a placard that read, "Fire in engine compartment, go immediately to idle." This was to prevent carbon dioxide being blown out by the cool air fan. If fire was noticed before the thermal contact responded, after removal of a safety pin the extinguishing process could be initiated with a hand lever on the electromagnetic valve.

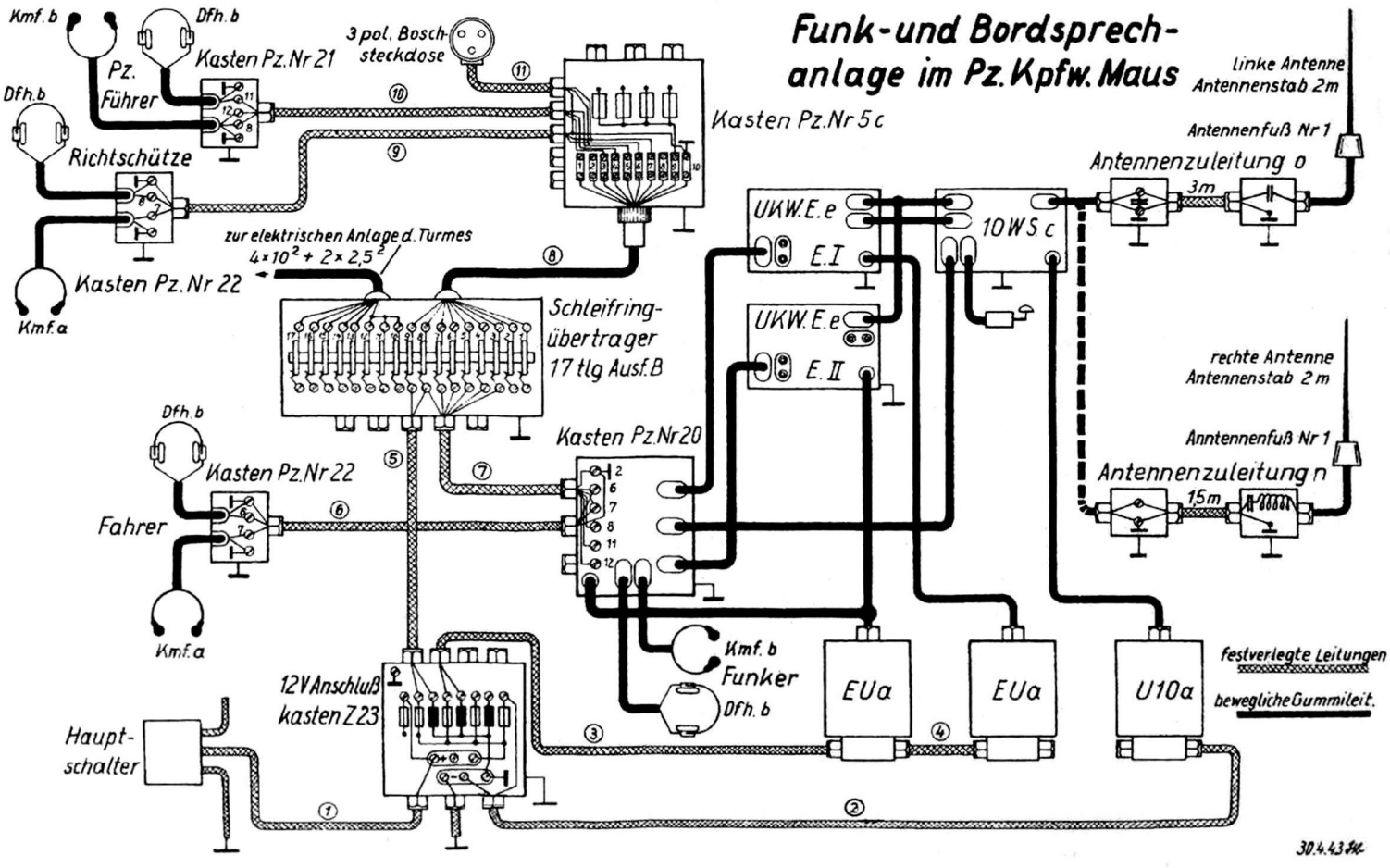




Electrical and Radio Systems Circuit Diagram

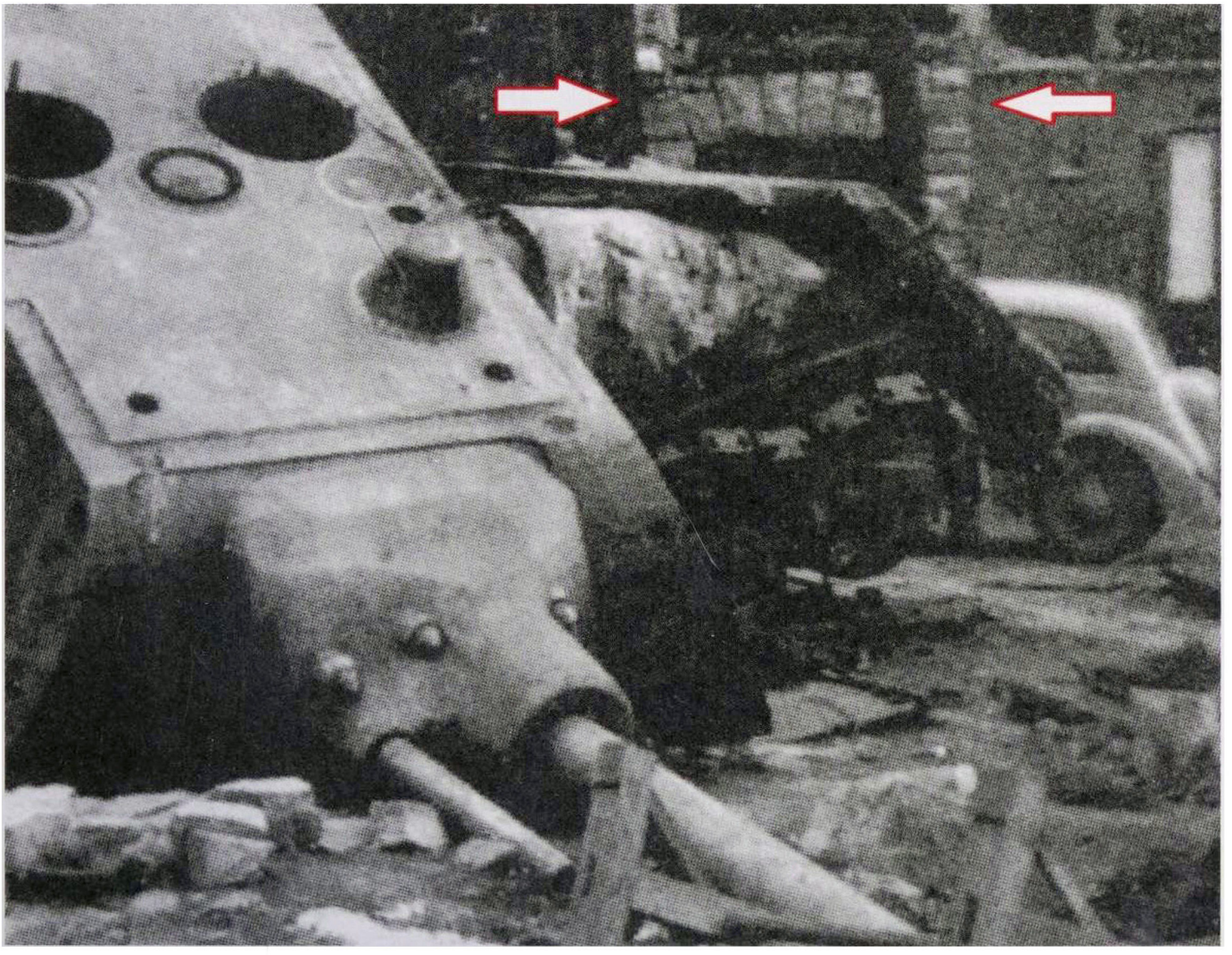
The FuG 5 transmitter-receiver was the radio equipment installed in the Maus. This system was the standard Wehrmacht tank radio set. It was capable of transmitting 4 km [2.49 miles] in radio-telephony mode and 7 km [4.35 miles] in wireless mode, and could receive from a distance of 2 km [1.24 miles]. It consisted of two UKW.E.e. (27.2 to 33.3 MHz) ultra-shortwave receivers and one 10 W.S.c. 10 Watt transmitter. A special feature was its twin 2-meter [6.56 ft] antennas in case one antenna was folded onto the hull by the two guns in an unfavorable turret position. The antenna was folded by an antenna deflector on the guns.

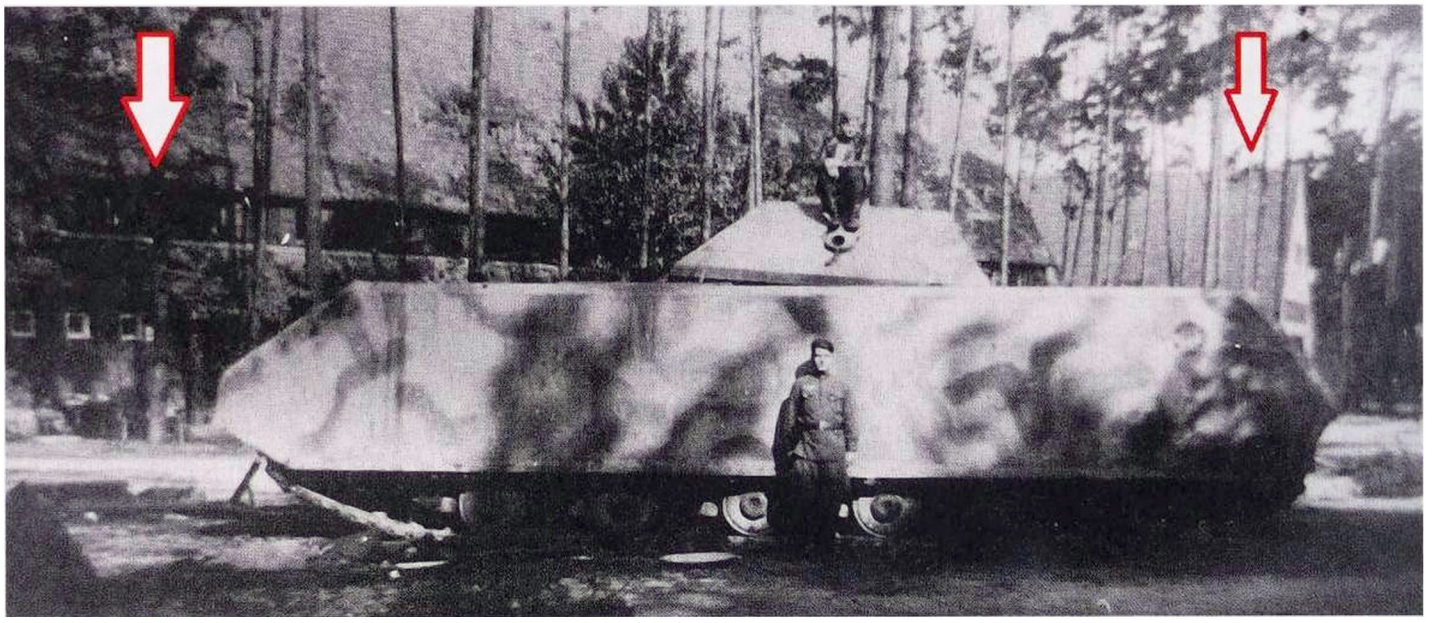




On the Trail of the Maus

Searching for the trail of the Maus does not just mean studying photos and documents; it also means bringing history back to life on the spot—in historical places. Tracking down the historical locations related to the history of the Maus was a painstaking task. Soviet literature contains some information about the Maus. The first thing I asked myself was where Maus 205/2 was blown up. The authors offer several sites: the intersection of the B 6 and the corner in the direction of Zossen, the firing range in Kummersdorf, and even Berlin is suggested as a possible place where it was destroyed. But shouldn't the victors know better than anyone? In the literature, a "*Stamplager*" near Wünsdorf is described as the site where the Maus was found. Translation is always a controversial matter. The term "Stamplager" appears in the garrison history and refers to the old Wünsdorf garrison of 1913. But where was Maus 205/2 supposed to have been? The photos (understandably all Soviet) show distinctive houses in the background with special entrance areas. Perhaps such a building is still standing, as all but one suffered only minor damage. And so I went to Wünsdorf. After a systematic search of houses, I found the background in the old photos I was looking for. It was in the "Book City," directly in front of the entrance to the Maybach I and Zeppelin bunker complexes. All of the buildings were correct; only the damaged house was missing. In the old maps it was described as a cinema. The building was destroyed in fighting on April 21, 1945, for it could still be seen in aerial photographs taken after the only major bombing raid on March 15. Records also indicate two films were shown after March 27, 1945. The other buildings, like the headquarters and baths, sit in a square and represent the former entry area of the Wünsdorf camp garrison. Behind it is the entrance to the bunkers. Maus 205/2 thus sat facing

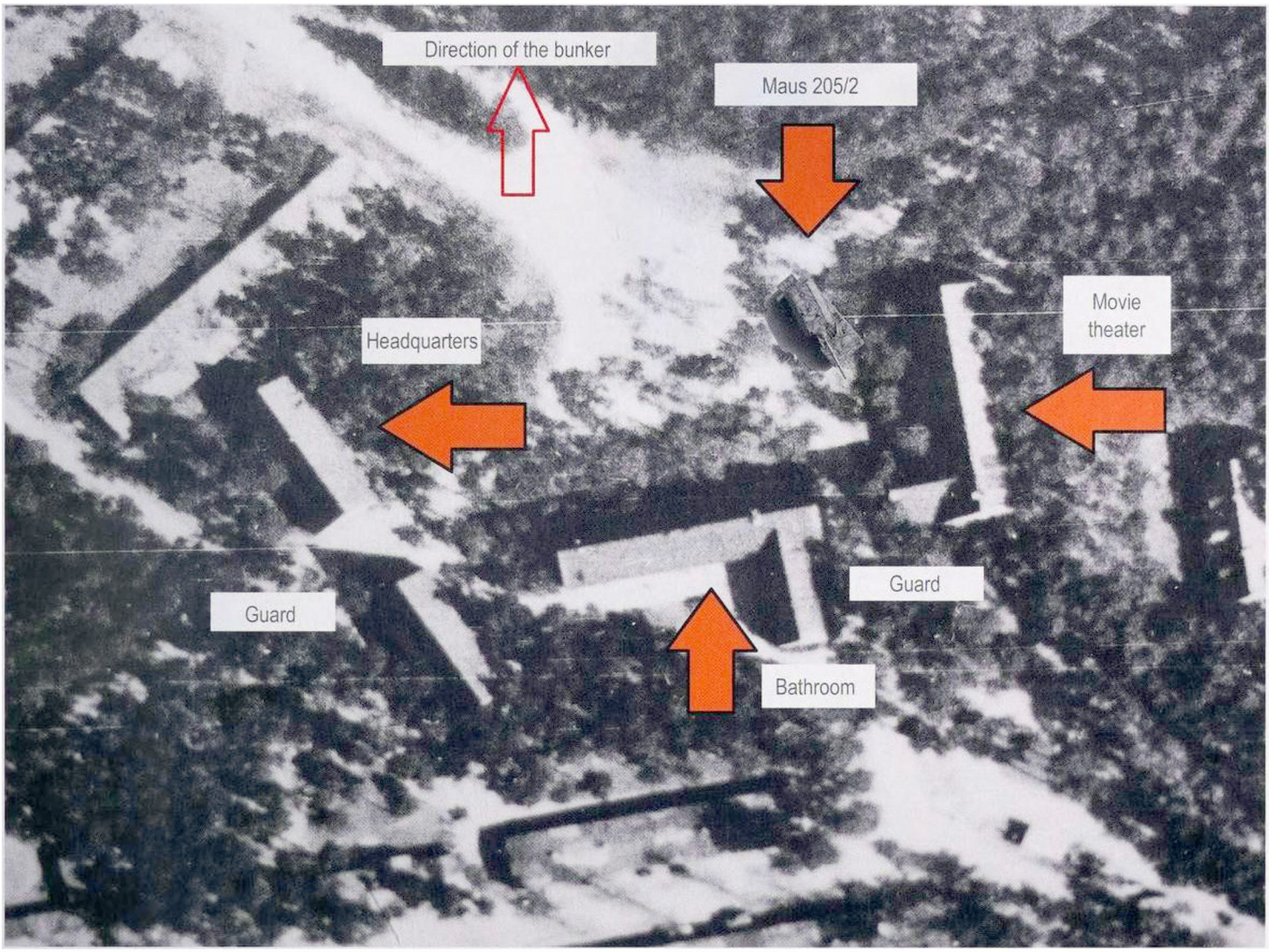




the access to Ludendorfstrasse in the direction of Reichsstrasse 96. But how did the Maus get there? On August 20, 2011, the provincial road agency of Brandenburg responded to my inquiry as to which local bridge could (today) support a load of 188 tons, advising me that load models were used to calculate bridge load capacities. Bridges could also be rated per STANAG 2021 classification on request:

> Here, however, Military Class 100 is accepted as the upper limit for wheeled and tracked vehicles in one-way traffic. This is roughly equivalent to a load of 1,200 tons, with a special arrangement of axles or load distribution surfaces. The load of 190 tons stated in your inquiry is far in excess of the usual rates for road bridges. The bridges in our jurisdiction have no documented load bearing capacity of the magnitude specified by you. We are also unaware of any special calculations for such loads in older records.

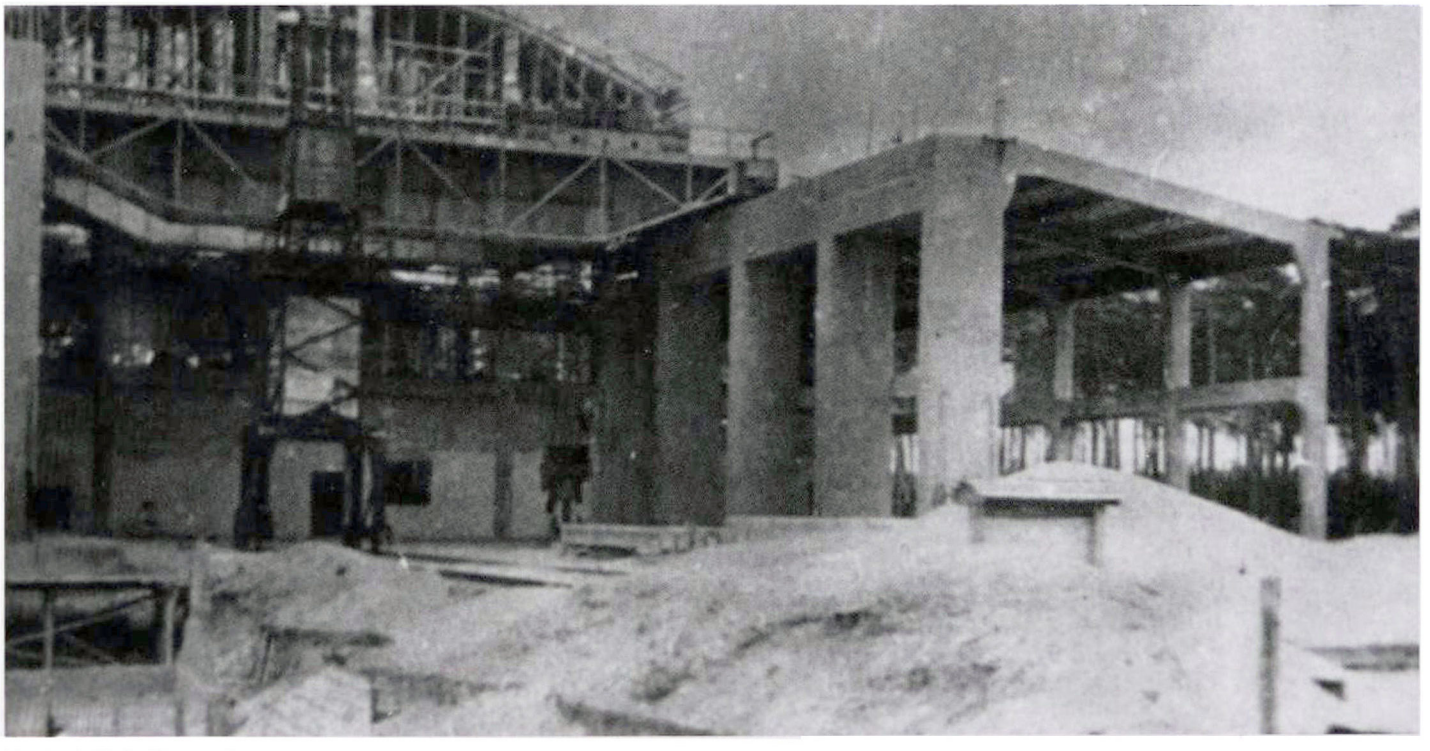
The Maus could have used its fording ability to cross the smaller streams, or it could have crossed smaller tube bridges. What could the chosen route from Kummersdorf-Gut have



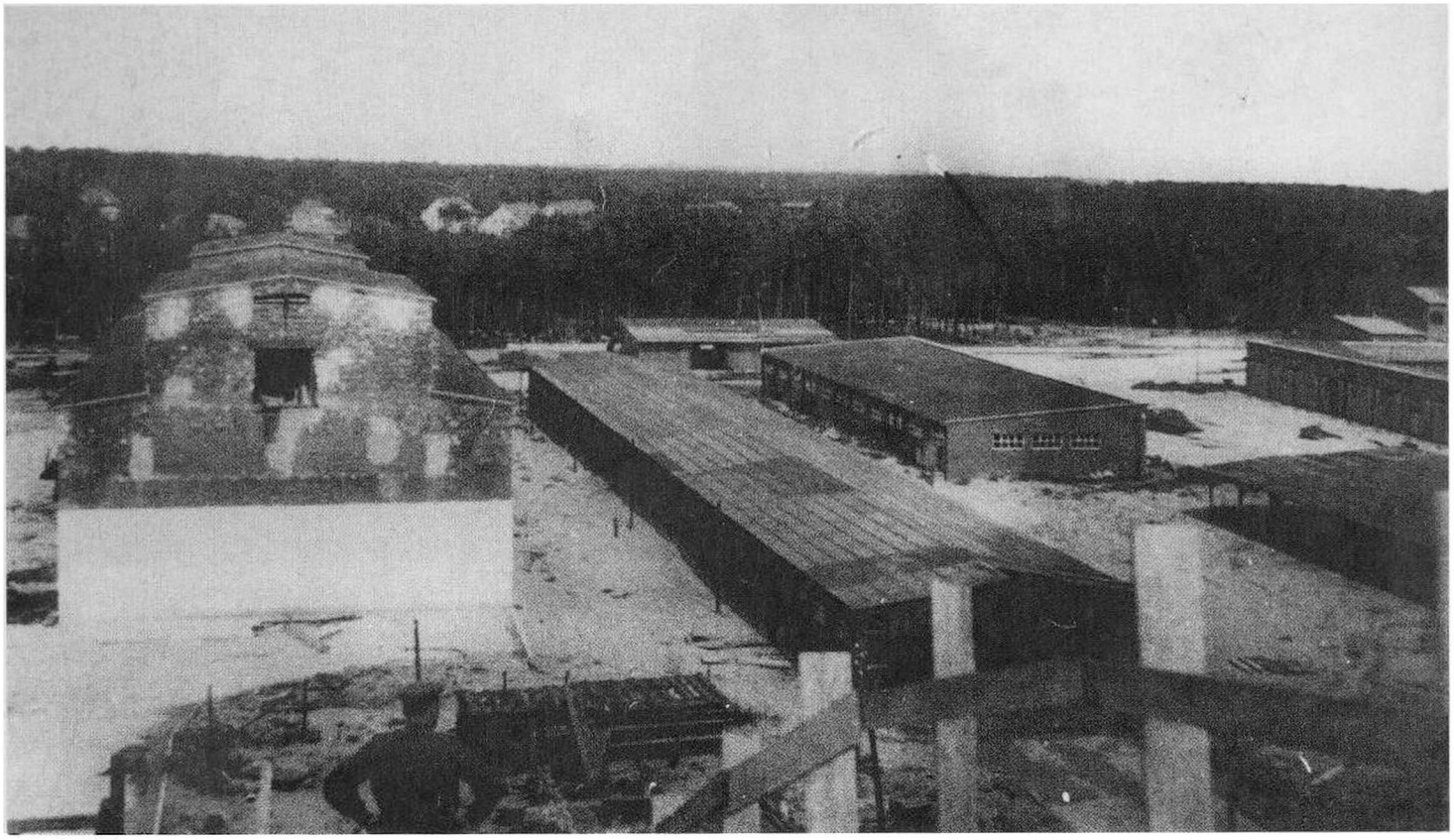
been? A cross-country drive was out of the question because of the many swampy meadows and high fuel consumption. There were only three routes to choose from, and the small bridge near Sperenberg would surely have been a problem, as it consisted of just one low-lying tube. The first potential route could have led through Neuhoff, but the two bridges there—approximately three and five meters [9.84 and 16.4 ft.] wide—were impassable for 189 tons. The second possible route led through Sperenberg and Klausdorf to Wünsdorf. There were three bridges on this section of road, but one of them was about five meters [16.4 ft.] wide and was therefore also not passable for a vehicle of this weight. The third possible route would have been the road north through Sperenberg, Klausdorf, and Mellensee to Zossen. Once again, there were three bridges, but the one over the Notte Canal had a span of just under ten meters [32.8 ft.]; this would have made it impossible for the 189-ton Maus to cross.

The special flatcar was most probably used for the transport to Wünsdorf, as the axle pressure of the 14-axle car was reduced to about 18.8 tons per axle and the weight per meter with a 180-ton load was 9.35 tons. Many sections had already been approved for axle loads of 20 tons. The railroad bridge over the Notte Canal near Zossen (Berlin-Dresden line) could have been used, as it was only about 10 to 15 meters [32.8 to 49.2 ft.] wide. According to Herr Neu of TM Fahrwegtechnik, this bridge was built for the transport of heavy goods in 1930, and could have accommodated this loaded heavy wagon. All that remains of the bridge today is a superstructure. Railroad traffic was still possible at that time, because on April 17, 1945, an armored train traveled the Berlin-Dresden line from Baruth in the direction of Golssen (according *Spurensuche*, vol. 9). Maus 205/2's subsequent history is described in the previous chapter. Next I tried to find the final location of Maus 205/1. This research was more challenging, because there are no conspicuous features visible in the backgrounds of the Russian photos like the Gutenberg houses in Wünsdorf. Soviet writings describe the location simply as "near firing range West" in Kummersdorf-Gut. This range is about 7.5 km [4.66 miles] long. While examining the photos I realized the work had taken place in winter, as there was snow present. In 1945, there was only snow in mid-December. The next significant snowfalls occurred in late February–early

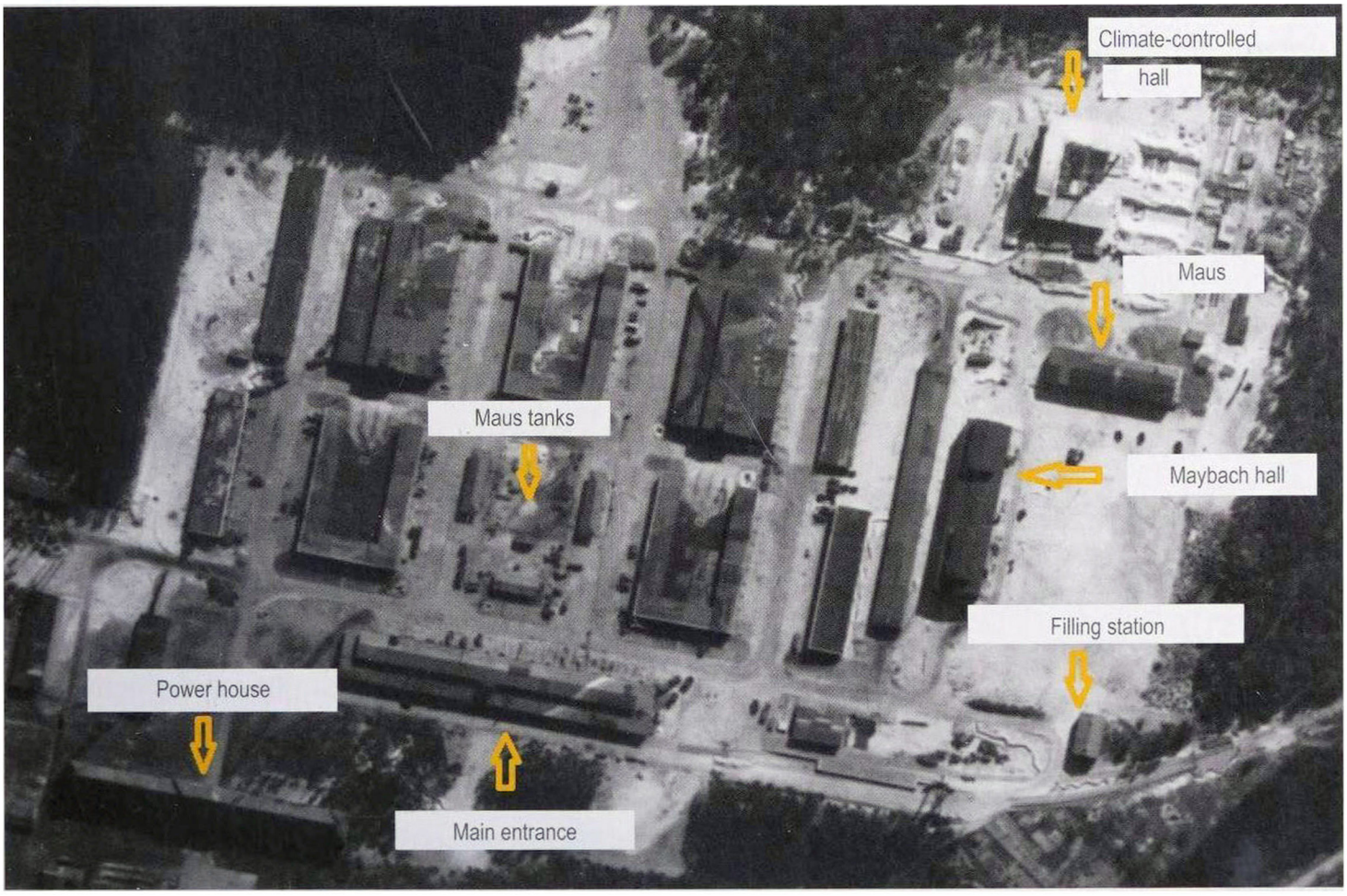
Maus 205/1 Detail 1946



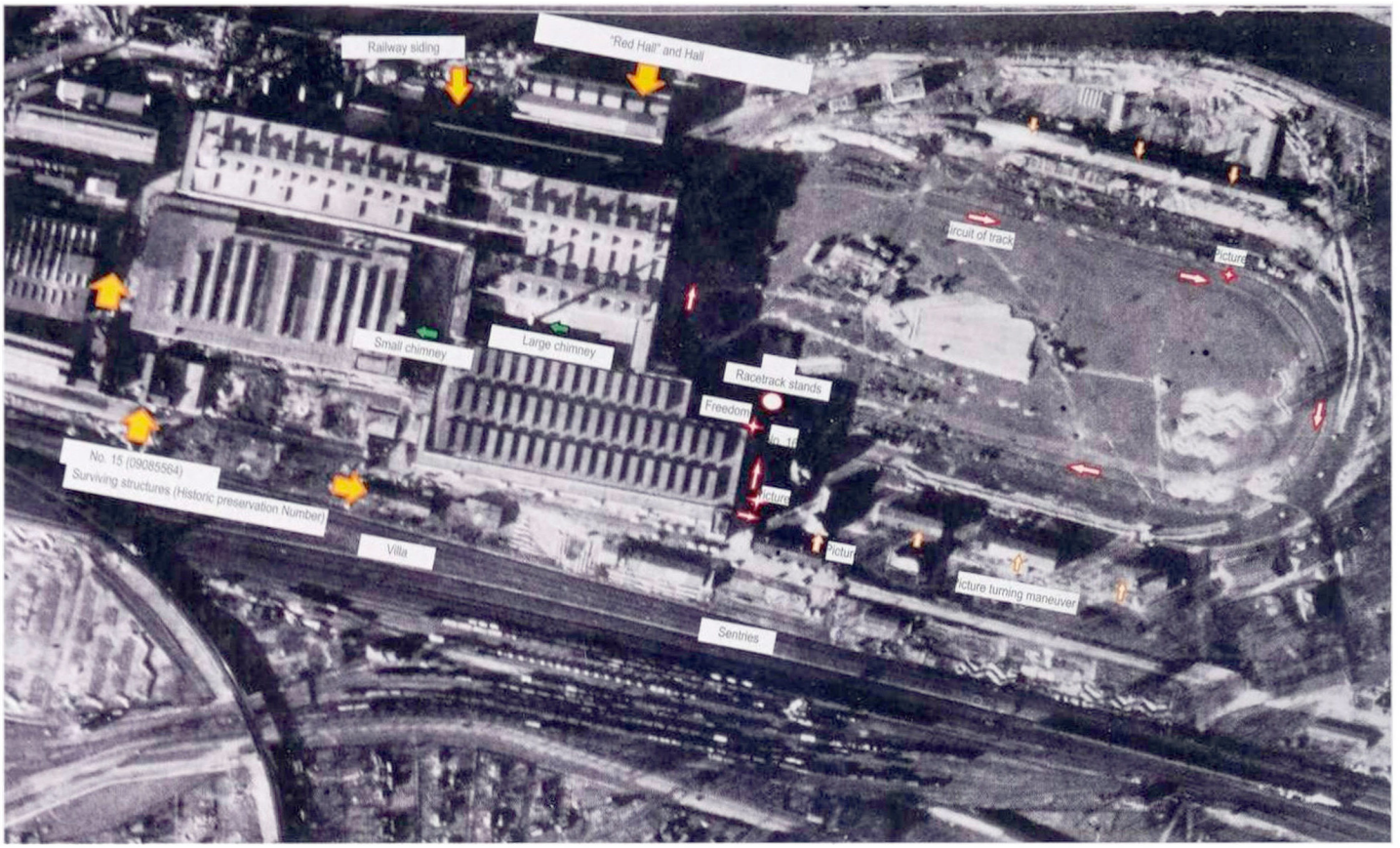
Maybach Hall with traveling crane.



View from "Maybach Hall" toward the VersKraft neu buildings.



View from "Maybach Hall" toward the VersKraft neu buildings.

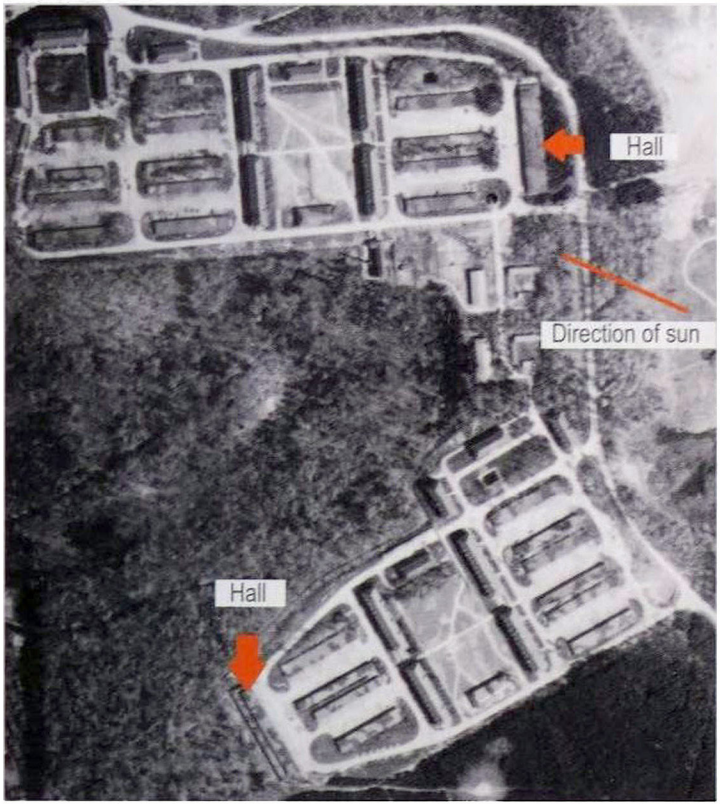


This aerial photo captured the first drive by Maus 205/1 in Ruhleben. The three surviving buildings are marked.

The parking hall today (compare with photo on p 95).

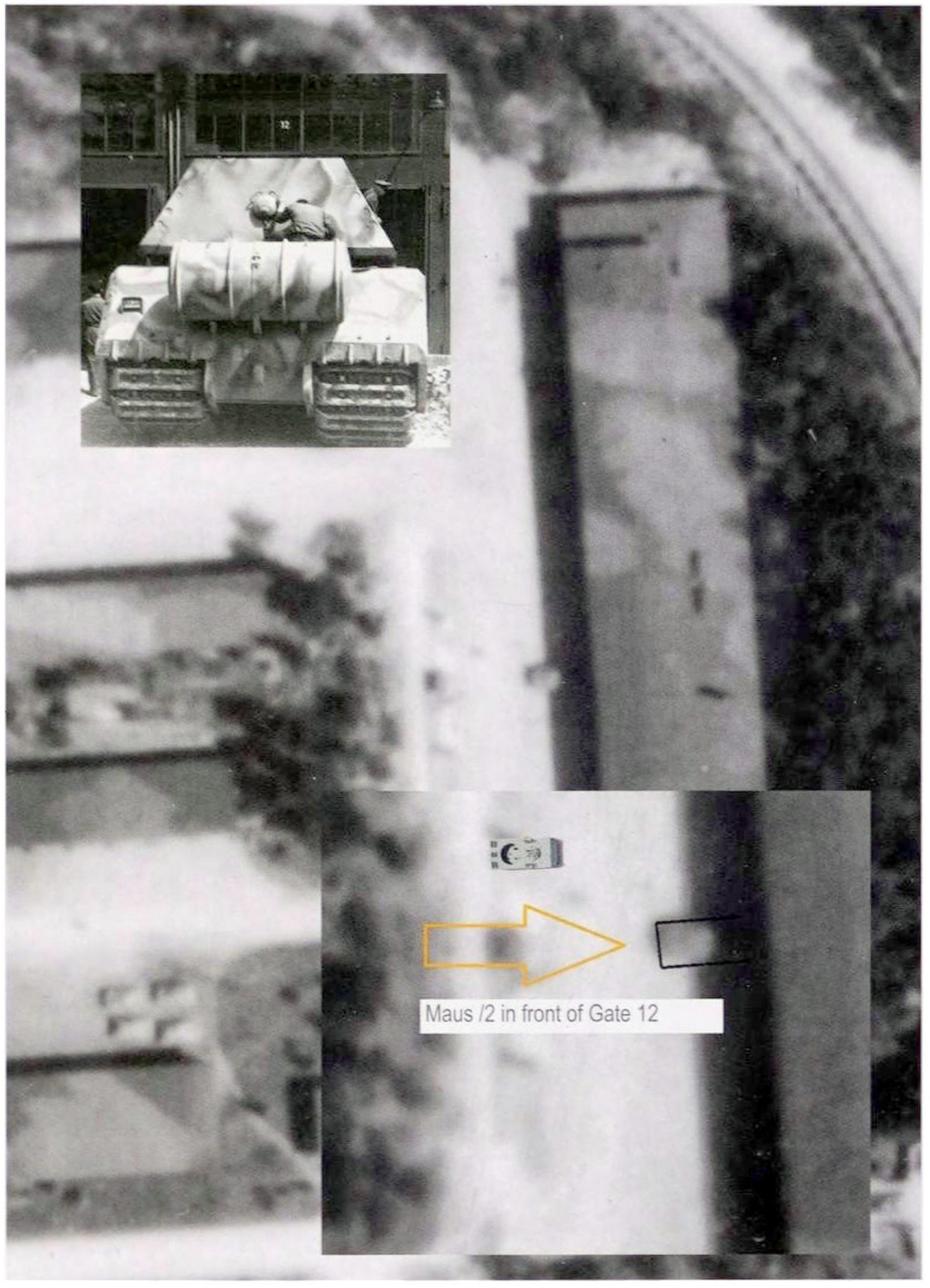
March 1946. As the snow soon melted, the assembly of the Maus tanks can be pinpointed to a period between mid-March and mid-April 1946. The direction of sunlight in another photo provided an important clue, as I was able to ascertain the vehicle's direction of travel was west to northwest. The sun in the photograph is low, confirming my assumption about the cold time of year. One clue to the location was the large open area in the background. In the aerial photos of May 13, 1943, apart from the firing ranges there were only two such areas north and south of Bensberg Lake whose locations made them candidates. Because of their many swampy areas, the two firing ranges would have been difficult for such a heavy vehicle to negotiate. Furthermore, the photos show an embankment with a row of trees behind which it is clearer. Embankments are rare in the lower part of Firing Range West. The narrow gauge railroad ties in front of the vehicle suggest it was near the firing range railroad embankment. My next conclusion was this heavy tank must have mainly driven on roads, especially as a (captured) Opel Kadett—which probably belonged to the Soviet photographer—is sitting on a field road in the background of the photo. This Opel Kadett was also visible in several photos in front of the former cinema in Wünsdorf. All of these clues led to the open field south of Bensberg Lake (see aerial photo). Maus 205/1 had thus been driven from Kummersdorf-Gut onto Firing Range West in the direction of the village of Schöneweide. In doing so, it probably used the firing range railroad embankment to bypass the swampy areas. The road on the embankment was used by troops breaking out of the Halbe Pocket in late April 1945. The next location in my search for tracks was the Army Experimental Station for Tanks and Motorization (VersKraft neu), the new vehicle proving grounds in Kummersdorf-Gut. The old VersKraft was eliminated on account of its different construction style—red clinker bricks and the absence of steel concrete struts. On-the-spot research revealed the presence of many buildings from the period before 1945. The

"Red" Hall Number 5, which has historic monument status.



Only two halls were considered because of the required dimensions. Once again, sunlight was an aid. The upper hall was the only one with a suitable irradiation angle.

one I was looking for had been used by a Red Army transport unit, during which one hall was torn down and then rebuilt. It was possible to ascertain the previous functions of some of the buildings. A high hall with a depth of at least 25 meters [82 ft.] was required for the former location of the Mause because the two tanks were positioned one behind the other. The distinctive steel concrete struts with the lined fields and the heating duct in the floor covered with boards eliminated all but the hall adjacent to Maybach Hall. This hall had actually been intended for this tank, as a 150-ton crane was planned. It was still under construction in 1945, and was unlikely to have been used to park the tanks during testing. My next objective was the birthplace of the Maus tanks, Alkett Berlin. The Alkett Company owned three factories in Berlin. The test records give the location as Berlin-Spandau and mention the driving tests took place on a racetrack. The Ruhleben trotting course was the only possible candidate. Located there was Factory III, on Freiheit [Street] Number 15–17. All that remains of the factory is one hall and two outbuildings, plus the rail siding then called Anschlussgleis 119. The rest was destroyed and torn down in 1945. Today there is a large sewage treatment plant and incinerator instead of the Ruhleben racetrack, which went bankrupt in 1955. Hall 5 ("Red Hall") is now protected as an historic monument and houses a large tank farm belonging to the TanQuid Company, so the hall cannot be reached for safety reasons. The last objective of my search for the trail was Böblingen. A large workshop can be seen in the background in several photos of the Mause (pp 70 and 92). It is quite long and has extensions on both ends. Here I was again helped by aerial photos from 1944, and by the fall of shadow in one photo located the Porsche workshop. Because of the size of the building in the photos only two halls could be considered. The sunshine was again an aid. The angle of incidence could only be correct for the upper hall. Enlargement reveals a large vehicle in front of a door in the center of the hall complex. It is definitely larger than the four tanks parked on the left. In a later photo (p. 91) Maus 205/2 can be seen parked in front of a garage door bearing the number 12, from which it had just been driven (see chapter on 205/2). The aerial photo is dated May 3, 1944, by which time the turret had arrived. The tank in the photo could very likely be Maus 205/2. The hall is even visible in present day aerial photos, although a few renovations have been made. The workshop hall is recognizable. The glass window was replaced with glass tile and of the nineteen original halls, just twelve doors or halls remain, as the lower part (approximately 35 meters [114.8 ft.]) of the building is gone. The old fueling station opposite the hall is also gone. The home of the former Panzerersatzabteilung 7 is now an American military base housing I Battalion of the Green Berets (airborne) and the



US Marine Detachment in Europe. Despite all requests I was denied access and am unable to include pictures of the hall as it is now. It is somewhat mysterious that former birthplaces of the Maus like Spandau and Böblingen are still heavily guarded and not accessible. The specially built depressed-center flatcars operated by the Reichsbahn were an important part of the history surrounding the Maus, so their fate is of interest. Of the three 14-axle depressed-center flatcars, only two have been identified by number: Stuttgart 918 799 and Berlin 918 392. The car from Berlin was often seen in pictures taken during the unloading of Mause 205/1 and 205/2. In the *Directory of Rail Cars for Unusual Transports in the Fleet of the German State Railway* produced by the Reichsbahn Central Office Göttingen on December 29, 1948, we find under Item II (former private depressed-center flatcars taken over by the State Railway) two 14-axle "special cars for tracked vehicles," specifically Berlin 918 392 and Stuttgart 918 799. Then, in November 1953, there appeared in *Directory of Rail Cars for Unusual Transports in the Fleet of the German State Railway* under Item G: 14-axle depressed-center flatcars Cologne 10 942 (old designation) as SSt, Type 47, 981421 (new designation). The second car, SSt Köln (Cologne) 10 943 (old designation), became SSt, Type 47, 981 422 (new designation). It seems unlikely one of these cars was really car Stuttgart 918 799, as it is clearly visible in the Soviet photo (p. 114) taken in 1946 at Kummersdorf-Gut Station carrying Maus 1+2. Both cars were retired by the Bundesbahn prior to 1969, and were probably scrapped, because there is no evidence nor documents concerning a sale.

Appendix

Maus Armored Fighting Vehicle Description and Instruction Manual

The Maus equipment description dated May 5, 1944, was superseded in many respects. It describes the MB 509 gasoline engine, although it would only be used in Maus 205/1. The more powerful MB 517 producing horsepower was intended for the production version. The equipment description still lists the MG 151/20 as the turret machine gun, even though the MG 34 was used as a coaxial weapon as described in the later equipment description.

Also incorrect is the amount of ammunition carried for the 75 mm gun, because this was reduced from 200 shells to 100. The error lies in the number of shells accommodated in the turret. Instead of 125 rounds it should read 25 rounds. They were accommodated forward on the right side of the turret next to the 75 mm gun.

In the rear of the turret there were two containers, each holding twelve 128 mm cartridges and projectiles. Many items are missing from the operating instructions, as development had not progressed that far when they were written. The same is true of the still missing service manuals. Unfortunately, some of the photos can no longer be found. The majority of those that were found, like the drawings, are contained in the chapter "Technology in Detail." The original spelling and typography found in the operating instructions reproduced here have been retained.

Notes on the Maus and Maus Turret Equipment Description and Operating Instructions

Contents

A) Technical Data

1) **Vehicle Dimensions, Performances, and Weights**

2) **Engine**

3) **Running gear and propulsion system**

4) **Fluid quantities**

5) **Armament and ammunition**

6) **Special systems in vehicle**

B) Description of Equipment in Chassis

7) **Vehicle overview**

8) **Armored hull**

9) **Engine**
- a) Designation and design information
- b) Specification
- c) Engine equipment and accessories
- d) Brief description of engine

10) **Fuel system**
- a) Tanks
- b) Filters, lines, fittings
- c) Special fuel system for auxiliary and cold-weather start

11) **Engine and brakes**
- a) Drive, electric component, twin electric generators, electric motors, electric start and control equipment, battery, circuit diagram
- b) Drive, mechanical component, drive transmission, brakes, drive wheel and planetary drives, safety clutch and stub shafts

12) **Running Gear**
- a) road wheels and suspension
- b) Track
- c) Dirt deflector
- d) Idler wheel and track adjustment

13) **Steering and Seats**
- a) Master driving switch
- b) Steering levers and driving switch operation
- c) Seat system and adjustment

14.) **Empty**

15.) **Hand Levers and Foot Pedals**
- a) Operation of hand brake
- b) Brake pedal system with hydraulic system

16.) **Switch Panel and Instrument Panel**

17) **Electrical Equipment**
- a) Battery for lights and radio
- b) Power consumers
- c) Fuses
- d) Interference suppression
- e) Circuit diagram

18) **Observation and Signaling Devices**
- a) Driver's optics
- b) Periscope
- c) Heading gyro

19) **Radio Equipment**
- a) Standard army description and manuals
- b) Emergency signaling system

20) **Equipment**
- a) Tools, spare parts and locations
- b) Environmental control system
- c) Drainage
- d) Automatic fire extinguishing system

21) **Armament and Ammunition**
- a) Weapons
- b) Ammunition and storage
- c) Ammunition, extracting and loading

22) **Special Equipment**
- a) Towing system
- b) Repair aids
- c) Underwater travel equipment

C) Manual and Driving Instructions

24) Putting into and taking out of service
- a) Preparations for driving
- b) Starting the engine
- c) Shutting down the engine and vehicle
- d) Special instructions for winter operation

25) Driving Instructions
- a) General
- b) Pulling away
- c) Driving, steering, braking
- d) Shutting down vehicle
- e) Driving on roads
- f) Driving off roads
- g) Special instructions for towing
- h) Anti-skid protection
- i) Transport and loading

D) Maintenance

26) General
- a) Break-in
- b) Maintenance overview

27. Engine with Equipment

28. Power Unit

29. Running Gear

30. Steering and Seat

31. Brakes

32. Hand Levers and Foot Pedals

33. Fuel System

34. Electrical System

35. Radio Equipment

36. Accessories
- a) Care of tools
- b) Environmental control system
- c) Drainage pumps
- d) Fire extinguishing system
- e) External fuel tank

37. Armament and Ammunition

38. Underwater Driving System

E) Repair Instructions

40. General

41. Engine

42. Fuel System

43. Power Unit
- a) Drive, electric component
- b) Drive, mechanical component

44. Running Gear

45. Steering

46. Brakes

47. Hand Levers and Foot Pedals

48. Electrical System

49. Accessories

50. Underwater driving equipment

F) Turret Equipment and Operating Instructions

G) Illustrations

Illustration 1) Vehicle, longitudinal section

Illustration 2) Vehicle in overhead cross-section

Illustration 3) Vehicle cross-section.

Illustration 4) Vehicle—overhead view with hatches and covers

Illustration 5) Side view and interior view of hull

Illustration 6) Forward partition, complete. Driver's side

Illustration 7) View of partition between

engine and generator compartments

Illustration 8) View of transverse partition in front of electric motor compartment

Illustration 9) Entry hatch with controls

Illustration 10) Engine, left side view

Illustration 11) Engine, right side view

Illustration 12) Engine installation

Illustration 13) Oil circulation system

Illustration 14) Cooling System
Page 1: Diagram of engine cooling circuit
Page 2: Diagram of exhaust cooling circuit

Illustration 15) Complete starter system

Illustration 16) Reduction gearing and transmissions

Illustration 17)
Page 1: Fuel system
Page 2: Fuel filter

Illustration 18) Valve switch

Illustration 19) Nebulizer hand pump for MB 509 starter fuel

Illustration 20) Double generator, external view

Illustration 21 Cable routing

Illustration 22 Electric motor and mounting

Illustration 23 Electric starter, control unit and battery mounting

Illustration 24 Wiring diagram for entire vehicle

Illustration 25 Total drive

Illustration 26 Reduction gearing - view and accessories

Illustration 27 Running gear, track tensioner, mud deflector

Illustration 28 Hand levers with seating, driving switch operation

Illustration 29 Oil pressure system and brake operation

Illustration 30 Control and instrument panel

Illustration 32 Environmental protection system

Illustration 33 Drainage system

Illustration 34 Fire extinguishing system

Illustration 35 Ammunition and storage

Illustration 36 Towing installation

Illustration 37 Submerged driving installation

Illustration 40 Lubrication and greasing work plan

Preliminary Remarks

This overview of the Maus armored combat vehicle is intended to call attention to the key features of the vehicle and to serve as a concise equipment handbook and aid for training, operation, and maintenance.
The Maus armored combat vehicle belongs to the heaviest class of tank and a certain amount of training is required to command it and keep it operational. Unusual for a tracked vehicle, it has electromotive drive, whereby the energy from a generator powered by a liquid-cooled engine is transmitted to two electric motors and two drive sprockets. The armored revolving turret is described in a separate manual that follows the description of the chassis. The following

description and instructions concern the chassis and its functional assembly, as well as parts whose mode of action is influenced by the driver. It also contains individual descriptions of the most important assemblies and equipment. The repair instructions are for the removal and installation of complete items of equipment and for the individual mounting of parts that are exposed to heavier wear, and for whose installation special tools are required and for such jobs that are possible for the crew inside the vehicle.
The numbers in brackets in the test refer to associated illustrations in the appendix. Where there are two numbers, the number left of the oblique line refers to the illustration number and the number on the right the part number in the illustration.
Porsche K.-G. Stuttgart drive testing is responsible for all inquiries and information.

A. Technical Data

1. Vehicle Dimensions, Performances and Weights

Overall length, barrel forward, 10.085 m [33.09 ft.]
Overall length, barrel pointing to the rear, 12.659 m [41.53 ft.]
Overall width 3.67 m [12.04 ft.]
Overall height (not counting antenna) 3.63 m [11.91 ft.]
Ground clearance 0.57 m [1.87 ft.]
Fording ability 2 m [6.56 ft.]
Maximum speed 20 kph [12.4 mph]
Allowable cruising speed (road) 18 kph [11.18 mph]
Fuel consumption per 100 kilometers [62 miles] (road) 1,400 l [370 mph]
Fuel consumption (moderately difficult terrain) 3,800 l [1,004 gals]
Range (road) 186 km [115.6 miles]
Range (moderately difficult terrain) 68 km [42.3 miles]
Range without external fuel tank 42 km [26.1 miles]
Combat weight 188,000 kg [207 tons]

2. Engine (for more detailed information see B9a 1-2)

Type MB 509
Cylinder arrangement inverted-vee
Displacement 44.5 l [11.76 gals]
Continuous power at 2,300 rpm (with cooling fan power) 1,080 hp
Cooling fan power 120 hp

3. Chassis: Type of drive electric

(Twin generators, each 400 KW, 2 electric motors) at 800 Volts
Gear ratio two electric motors and drive sprocket normal gear 1 : 25.44
Gear ratio two electric motors and drive sprocket low gear 1 : 48.68
Road wheels per side: 24
Road wheel system: steel bearing rings, rubber-saving
Suspension system: Porsche knee levers with balancing effect
Track circulation length without ground effect 5.9 m [19.4 ft.]
Track width 1,100 mm [43.3 in.]
Ground pressure at 20 cm [7.87 in.] sinking depth 1.31 kg/cm² [18.6 lbs/in²]
Wheel pressure in center 3,580 kg [7,893 lb.]
Brakes: one disc brake per road wheels in the drive primary reduction gearing, self-adjusting, oil pressure 60 atm and 2 foot pedals, 2 hand levers and cable as parking brake
Steering: electric with 2 steering hand levers and speed regulator.

4. Fluid Quantities

Engine liquid cooling system Water 109 liters [28.8 gals]
Rust proofing oil mixture 6 liters [1.59 gals]
For winter operation: glycol 57 liters [15.06 gals]
Water 52 liters [13.74 gals]
Exhaust liquid cooling system Water 72 liters [19 gals]
Rust proofing oil mixture 3 liters [0.79 gals]
For winter operation: glycol 37 liters [9.78 gals]

Water 35 liters [9.25 gals]
Rust proofing oil mixture 3 liters [0.79 gals]
Engine lubrication: oil circulation system, Intava Rotring oil 90 liters [23.78 gals]
In winter
Cold start mixture as per D (Luft) T3870 90 liters [23.78 gals]
Oil-wetted filter engine oil (used oil) 2.5 liters [0.66 gals]
Ventilator drive Intava Rotring oil 3 liters [0.79 gals]
Auxiliary gasoline engine Intava Rotring oil 2.3 liters [0.61 gals]
Gearbox oil: dust extraction fan 1 liter [0.26 gals]
Drive: each reduction gearing unit 12 liters [3.17 gals]
Planetary drives each 30 liters [7.93 gals]
Drainage pumps approx. 0.8 liters [0.21 gals]
Pressure oil: accelerator pedal and low gear shift mechanisms approximately 3 liters [0.79 gals]
Auxiliary pressure oil for brake activation approx. 13 liters [3.43 gals]
Fuel: 2 main tanks with a combined capacity of 1,600 liters [422.7 gals]
Auxiliary fuel tank 1,000 liters [264 gals]
Starter fuel tank (mixture) 7 liters [1.85 gals]
1 starter fuel tank for auxiliary gasoline engine 1 liter [0.26 gals]
1 starter fuel tank for MB 509 and sump pump 1 liter [0.26 gals]

5. Armament and Ammunition

1 KwK 12.8 cm L 55
1 KwK 7.5 cm L 36
1 MG 151/20 in turret
1 submachine gun in turret
1 smoke shell projector
Ammunition: separate projectile and cartridge
128 mm shells, 25 in turret, 43 in hull = 68
75 mm shells, 125 in turret, 75 in hull = 200
Total = 268

6. Special Systems in the Vehicle

1 auxiliary gasoline engine with 48 V/5.5 kW generator for battery charging, engine compartment heating, and starting assistance
1 compartment safety system
1 fire suppression system
3 drainage pumps
1 acetylene cold start system with Dissous acetylene gas cylinders
1 underwater travel system

B. Description of the Chassis

7. Vehicle Overview

For the purpose of general overview, the chassis is divided into assemblies as in the table of contents under B) (7–23). The overview drawings (illustrations 1, 2, and 3) show the entire layout of the armored hull and the latter as receptacle for the engine, drive, running gear, and all installations. The left half of illustration 3 shows (looking forward) a cross section along the transverse bulkhead between the blower and fuel tank. The outer side walls (3/1 and /2) of this hull extend downward to the prescribed ground clearance over the entire length of the running gear to provide protection against projectiles and to support road wheels suspension (3/3), drive sprockets (1/2), and planetary drives (25/1) in drive sprockets (1/2). The interior of the hull is divided by partitions longitudinally into a driver/radio operator's compartment and three machinery compartments. For the purpose of creating cooling air pressure chambers, the latter are in turn subdivided by bulkheads or airflow walls into a pressure chamber for cooling and exhaust air for the combustion engine (1/3); electric generator (1/4); and into pressure chambers (2/1), (2/35), and (2/2); and (2/36) each for an electric motor (2/3) and (2/4). Located behind the forward bulkhead (1/5) to the radio operator/driver's compartment and the side spaces for fuel tanks (2/5) is the Daimler-Benz MB 509 liquid-cooled gasoline engine with cooling system and combustion air feed (1/32), connected to the double generator (1/4) (electric generator) by a gearbox (1/6)

and tooth clutch (1/7). Electric motors (2/3 and 2/4), which operate on current produced by the generator, are attached by band clamps—one motor left and right—over the drive sprocket (1/2) and power the drive sprockets, and with them the tracks by means of a safety clutch (2/9), torsion drive (2/10), spur gear (1/8) with gear brake (1/9), and low gearshift via two planetary drives (25/1). The power and speed of the MB 509 gasoline engine are controlled by means of a hydraulically actuated foot pedal (2/11). The vehicle is steered electrically by means of a steering lever (1/11) at the driver's lift seat (1/12), with the master driving switch (2/12) above the driver to the left simultaneously controlling the flow rate of the electric motors. Two brake pedals (2/13-14) operate disc brakes in each of the drive transmissions by means of an auxiliary pressure oil system (1/13). The brakes are also used as parking brakes and, when needed, as auxiliary steering brakes. The driver also monitors two instrument panels and a control panel (1/14). The driver's tasks also include operation of the pull start (6/1) and starter hand pump (6/2), low gear selector (1/15), fuel tank transfer switch (6/3), parking brake (1/16), entry hatch cover (1/17), emergency escape hatch (2/15), acetylene system (2/16), cold start, driver's angled periscope (1/18), and lifting seat control (1/19), as well as the telekin cable (2/17) for operation of the cooling air exhaust regulating flaps (3/4) for the purpose of controlling engine coolant temperature and the telekin cable lever (2/18) for the main battery switch (2/19). To the right of the driver's seat is the radio operator's seat (1/20) and beneath it the battery for the lighting and radio system, as well as the radio system (1/21) and fire extinguisher control (1/22).

The running gear consists of four rows each of six pairs of road wheels, with each pair of road wheels (1/23) independently sprung by knee levers (1/24) and volute springs. The track (1/10) sags and rolls on return rollers (3/5) beneath side bearers that are concealed by the deep-drawn outer side walls. Track tightening is accomplished on the forward exterior by an adjusting guide wheel (1/21) in a longitudinal guide (27/32) in the forward outer wall (left and right). Covering the entire running gear with the outer armored walls requires special installation instructions for work on the running gear. Also on the outside of the vehicle are attachments for the towing apparatus (1/26), external lighting (1/27), the antenna in functional position (1/28), a jettisonable fuel tank for travel to the front (1/29), and a deflector (1/30) to shield the cooling air hatch forward of the turret against shrapnel and shell fire.

An electric motor in the turret is responsible for traversing the turret and gun. It is powered by the converted voltage of the battery current via the transformer (1/52) and the slip ring transducer (5/1) (for more information see Turret Description D/). Part of the environmental control system, a blower and filter system (1/53) provide the driver's, radio operator's, and turret crew spaces fresh and hot air.

A Type 241 auxiliary gasoline engine (1/43) with 5.5-KW generator provides charging current for the main and starter batteries (2/20), heating current for the environmental control system's (1/53) heating coils, and warm air for the gasoline engine compartment (cold weather starting aid). The transformer (2/21), environmental control system (2/22), auxiliary gasoline engine (2/23), and the main battery are together in the hull's right side space (2/24). Above the battery is an open area for the tool kit (1/54) and other equipment.

Three electrically powered drainage pumps (1/56 and 2/25), one each for the brake and reduction gear, generator, and the MB 509 engine compartments, are fitted to deal with leakage in the hull interior. The covers and switches for controlling the electrical devices and equipment are installed together in the

main instrument panel (2/26) on the right side of the generator compartment. The 128 mm ammunition (2/27 and 2/28) and the two-part version (1/55) are distributed on the left and right sides of the vehicle and in the center (lengthwise) behind the turret outside the platform and in the turret itself. The vehicle can be converted for submerged operation with an additional UK installation carried by the supply train.

8. Armored Hull (Illustrations 4–9)

The armored hull has hatches screwed on from the outside for the installation and removal of and access to individual items of equipment, air passage hatches for the gasoline engine, and electric generator and electric motor, as well as a screw-mounted circular hatch (illustration 5) for the stub shaft from the electric motor to the drive transmission and for the stub shaft from the drive transmission to the planetary drive in the drive sprocket, plus a hinged lid for the tank filler opening and a combined hinged lid for the engine oil, starter fuel, and pressure oil filler openings, as well as for access to the fuel cock filter and mixture filter for the Viktoria-Riedel starter engine. There are two threaded caps joined by a common chain on the left and right sides of the vehicle for coolant filling. A third such threaded cap, secured to the hull decking by a chain, is at the entrance to the wet filter for the engine combustion air.

Mounted in the floor of the hull are the escape hatch covers with jettison latch safety, a hinged cover with spring weight balance for access to the engine from below and twelve socket head screws so the cover is well-sealed through additional tightening, plus two hinged covers that are also tightened by socket head screws for access to the drainage pumps. The second of the two hinged covers also provides access for draining oil and cleaning the filter on the drive transmission.

The entry hatch cover (1/17) is opened from the outside by unscrewing the locking screws (9/2) using a round assist rod with a maximum diameter of 15 mm [0.59 in.] or any available key shaft of similar size; the locking lever (9/4) also turns in the process. As the entry hatch cover has a counterbalance spring (9/5), it can be raised with the help of assist bars that are inserted into the bore holes of the locking screws. The opened hatch is secured with the assistance of the bell crank (9/6), with which the contact point of the pressure rod is pushed through dead center. When closed from inside, this lever (9/6) is pushed shut through dead center independently, or with the aid of the cable (9/8), the hatch cover is grasped by the grip (9/9) and is pulled tight and locked by means of tommy screws (9/10). When closed from outside, the contact point of the pressure rod is pulled through dead center with the help of the cable (9/8) and the latter is thrown inside the vehicle before the hatch cover is closed. The unscrewed hatches and air passage cover (9/11) are only removed during the removal of the larger engine assemblies, the combustion air filter (1/32) and fuel tanks (2/5 and 2/6), or conversion of the vehicle for submerged travel. The forward partition (1/5) is not only a bulkhead for the purpose of sealing off the compartments from one another, but also a mounting surface for various controls (illustration 6). On the driver's side are controls for fuel regulation (6/1), starter hand pump (6/2), starter pull cord (6/3), a bulkhead door (6/4) for access to the engine equipment side, and a bulkhead hatch (6/5) for access to the oil filter on the engine. The following conduits pass through the bulkhead: for lines to the driver's foot pedal (6/8), low gear selection (6/7), oil pressure brake system (6/6), fire extinguisher system (6/19), oil filter activation (6/17), acetylene gas system (6/18), and brake cable for hand brake operation (6/20) and telekin cables (6/16), as well as two cable channels for electrical lines and an opening for the entry hatch compensating suspension. Also

on the partition are a control and equipment panel behind the radio operator (6/11), instrument panel II (6/12) with fuel indicator instruments (6/14) and oil pressure gauge (6/15), plus a receptacle (6/13) for the driver's headset. On the engine compartment side of the forward partition are the firewall sockets (1/13) for the gasoline engine's ignition system. In addition to the accessories permanently attached to the engine, including the step-up gears (1/6) and "Viktoria-Riedel" starter engine (1/38), distributed throughout the engine compartment are assemblies for the engine and its operation, such as the oil cooler (2/29) and radiators (2/30 and /31) with fan (2/32), combustion air feed (1/32) with filter (1/33) and dust extraction system (1/34), alternator cooling (1/35) and crankcase ventilation, plus exhaust system (1/37) and drainage pumps with lines (2/25). The next transverse partition (1/40) separates the generator compartment from the combustion engine compartment. It has an opening to accommodate the generator during installation until the fitting of a sealing ring (1/41). Other openings are provided to accommodate the auxiliary gasoline engine's exhaust (1/42) and the Telekin cable for the battery switch and brake cable. There is access from the engine compartment to the crew and turret compartments by means of a bulkhead hatch (1/44) in slanted bulkhead 1/44, which runs from the generator cover (1/46) upward to the combustion air filter and turret ring (1/47). During operation and use of the bulkhead hatch (1/44), rotation of the turret (1/48) is blocked by an emergency switch (1/49) to prevent accidents. Together with the multi-piece generator cover plates (1/46 and illustration 5) and the bulkhead sloping forward and upward (1/45), the aft transverse bulkhead (1/50) for the electric motor compartment, brakes, and drive gearing forms the engine room compartment top cover against the turret and crew compartment. The aft partition serves a variety of purposes. It has upward openings (1/51) left and right for cooling air for the electric motors, under pressure chambers (2/1 and 2/2) toward the reduction gear and brake compartment (2/33) and its exhaust air chamber (2/35 and 2/36), and is sealed off by a two-part, ducted partition (2/34) the size of the electric motor towards the under-pressure or air intake (air from the generator compartment) chambers (2/1 and 2/2). The bypass flaps (8/2, 8/3, 8/4, and 8/5) in the aft transverse partition (1/50) are opened during the change to submerged travel and are reset for the purpose of redirecting exhaust from the generator through the two inner flaps (8/2 and 8/3) and from the electric motor through the outer flaps (8/4 and 8/5); likewise, the flap in the sloping bulkhead between the crew and combustion engine compartments (1/37) for fresh air feed and air circulation is also opened. Cradle supports (3/7 and 3/8) are mounted on the sides of the inner and outer side walls facing the tracks to accept the running gear cross members (3/6) for the road wheels and their suspension so that two adjoining road wheels pairs with guides and suspension can be replaced as an assembly.

9. Engine:

Each engine installed in the Maus armored fighting vehicle comes with a maintenance history file with brief operating instructions and a maintenance schedule.

a) Designation and Construction Data Maus Battle Tank

General:

a) The Mercedes-Benz MB 509 special engine is an in-line engine with two banks of cylinders—each with six cylinders—in a sixty degree inverted

vee configuration. The engine is a four-stroke with fuel injection and supercharger. The injection volume is determined by an automatic controller installed on the injection pump. The crankshaft's direction of rotation is counter-clockwise. The direction of rotation at the intermediate gearing drive is also counter-clockwise.

b) Cylinders – sequence: view of the hanging cylinders from above

1 2 3 4 5 6
7 8 9 10 11 12

Number of cylinders: 12; bore: 162 mm [6.4 in.]; stroke: 180 mm [7.09 in.]; total displacement: 44.5 l [11.76 gals];
Compression: 1 : 5.9 + 0.1 left cylinder bank; 1 : 6.1 + 0.1 right cylinder bank

c) Valves: number of inlet valves per cylinder: 2

Number of exhaust valves per cylinder: 2
Valve timing: the control settings are based on a valve timing, namely always at outlet commencement = 67° before top dead center (+/- 1.5°) of the double cam for the first and seventh cylinders.
Valve lift: 14.1 mm [0.56 in.] (without valve play)
Valve play: measured with cold engine between valve and pressure fitting
Inlet 0.3 mm [0.012 in.] (in no case change when setting valve control)
Exhaust 0.6 mm [0.024 in.]

d) Magneto with summer ignition and complete shielding

Type: Bosch ZM 12 C R 8 (9-4040 E)
Number: 1
Ignition point adjustment: automatic independent of power lever via loose coupling over a cam disc.
Speed: half crankshaft rotation speed
Direction of rotation: clockwise looking at the magneto drive
Ignition sequence: 1, 11, 2, 9, 4, 7, 6, 8, 5, 10, 3, 12, 1
Setting: at full spark advance with summer 35° before top dead center at 2,300 rpm

e) Sparkplugs

Type: Bosch DW 225 ET 7 with VHF interference suppression
Number: 2 per cylinder

f) Starter

Type: Riedel ALM part number 9-7033 A

g) Injection Pump

Type: Bosch PZ HP 120/22 (9-2200 B 1) with installed EP/HB52/9 (9-2151 B) automatic mixture controller. Fixed height control and float air vent
FP/LQ 300/3 (9-2142 B)
Number: 1 in suspended arrangement
Direction of rotation: counter-clockwise viewed from the drive side
Speed: half crankshaft rotation speed
Element number: 12
Piston Stroke: 10 mm [0.394 in.]
Piston diameter: 12 mm [0.472 in.]
Maximum Flow rate: per element and stroke 850 mm^3 [0.052 in^3]
Control rack travel: 21 mm [0.827 in.]
Arrangement of elements: suspended
Numbering of elements: 7, 8, 9, 1, 2, 3, 4, 5, 6, 10, 11, 12
Injection sequence of elements: see ignition sequence
Delivery start: 65° +/- 2° after top dead center (intake stroke)
Quantity of lubricant: in the mixture control casing 1,200 cm^3 [73.23 in^3]
Lubricant pressure: To leakage stop 4 kg/cm^2 [56.9 lbs/in^2]
To power amplifier 8 kg/cm^2 [113.8 lbs/in^2]

h) Injectors

Type: Series 1 and 2 Bosch (9-2122 D) and l'Orange (9-2261 C)
Number: 1
Flow rate: 500 l/hr
Fuel pressure: 1.3 to 1.8 kg/cm^2 [18.5 to 25.6 lbs/in^2]

k) Supercharger

Manufacturer: Daimler-Benz
Short designation: single-stage centrifugal blower powered by a hydraulic coupling. Supercharger speed is directly dependent on engine revolutions. Overall gear ratio between crankshaft and supercharger 1 : 65.
Boost pressure: 1.225 Atm. at 2,300 rpm.

l) Lubricating oil recirculator: Type: DB gear pump
Oil pressure: at an inlet temperature of 75°C [167°F] (+/- 5°) and 2,300 rpm and driving straight ahead, oil pressure must not exceed 2.8 kg/cm² [39.83 lbs/in²].
Flow rate: approx. 42 kg/min [92.6 lbs/min] at n = 2,300 rpm and 75°C [167°F] inlet temperature

m) Main oil return pump (from collector tank to oil cooler)
Type: DB double gear pump
Flow rate: approx. 65 kg/min [143 lbs/min] at n = 2,300 rpm

n) Auxiliary return pump (from cylinder covers to collector tank)
Type: DB gear pump
Number: 1 per cylinder block
Flow rate: 6 kg/min [13.2 lbs/min] at n = 2,300 rpm

o) Transmission oil pump from transmission via the equipment case to the collector tank (DB gear pump)
Number: 1
Flow rate: 45 kg/min [99.2 lbs/min] at n = 2,300 rpm

p) Coolant pump
Type: DB centrifugal pump
Flow rate: 45 kg/min [99.2 lbs/min] at n = 2,300 rpm

q) Air vapor separators
Type: DB
Number: 2

r) Double speed governor
Number: 1
Direction of rotation: clockwise seen from the drive side of the governor.
Reduction ratio: 1 : 1

s) Intermediate gearing
Type: Dr. Porsche KG
Manufacturer: Zahnradfabrik Friedrichshafen AG
Gear ratio: 1 : 1.05, fixed installation on engine with two drives for the fan systems.

t) Exhaust collector
Number: 1 per cylinder block, liquid cooled with air vapor separators

u) Additional water pump for exhaust cooling
Type: DB centrifugal pump
Number: 1
Flow rate: 18 m³/hr [1.098 in³/hr] at n = 2,300 rpm

v) Overspeed regulator
Type: A. Teves, Frankfurt a.M.
Designation: A 30 055/T 7331

b) Operating Data

Types of Fuel

Fuel: OZ 74 regular fuel leaded per special instructions
Starter fuel: Fl. Starter fuel as per RLM directive (for starter nebulizer pump and engine starters)
Cold start mixture: as per D. (Luft.) T. 3870
Oil: Rotring as per RLM regulations
Grease: Calypsol as per RLM regulations (for coolant pump grease guns)
Coolant: see following RLM regulation (contents in engine 40 kg [88.2 lb.])
Regulation for coolant: mixture of 50 parts water and 50 parts glycol. This mixture is adequate for an external temperature to -38°C [-36.4°F]. Protective oil in coolant: add 1.5 parts Type 39 protective oil to 100 parts coolant.
Weight: Combined weight of engine plus transmission and exhaust 1,125 kg [1.24 tons] + 10%

c) Engine Equipment and Accessories

a) Installed on engine on delivery:

1 injection pump
1 mixture controller
1 float air vent
1 thermal sensor
12 fuel injectors
1 fuel transfer pump
1 twin magneto
24 sparkplugs
1 supercharger with hydraulic clutch
1 oil metering pump for hydraulic clutch
1 power booster
1 oil recirculation pump
1 coolant pump
1 Riedel starter
2 air vapor extractors
1 coolant pump for exhaust cooling
1 controller for speed limiter

Can be connected to engine but not installed at delivery:

2 generators
1 engine speed sensor
1 line to ignition nebulizer pump
12 automatic thermal sensors
2 exhaust collectors (left and right) due to liquid

d) Brief Description of the Engine

1) Crankcase

The crankcase is a single-piece light metal casting. A gearbox cover that accepts the ZF gearing is bolted to the front. The accessory drive casing is bolted onto the rear walwlat surfaces to which the two cylinder blocks—arranged at a 60 degree angle to one another—are bolted. A ventilator with two connections is installed atop the cover for ventilating the crankcase. Four lifting eyes, which must only be used with a special attachment harness, are provided for lifting the engine.

2) Crank Mechanism

The crank mechanism consists of:

a) Crankshaft
b) Connecting rods
c) Pistons

Crankshaft: The crankshaft, with its six crankpins, is wrought from a single piece and has seven bearings. The front end of the crankshaft has a splined cog to drive the pinion gear. The rear end has an elastic drive for the equipment motor and a drive dog for the starter.

Connecting Rods: The twelve connecting rods work in pairs on the crankshaft and are mounted on the crank pins by a common bearing in such a way that the forked rods are fix-mounted to the intermediate sleeves by means of overlaps and locking pins, while the unforked rods slide on the intermediate sleeves.

Pistons: The engine uses pot pistons whose piston pins are float-mounted and are secured to the sides of the pistons by light alloy mushrooms. The pins are lubricated by splash oil from the crankshaft that enters through holes drilled in the piston bosses.

3) Cylinders and Control

The engine's twelve cylinders are housed six each in two cylinder blocks suspended in a 60 degree V arrangement. The threaded throats of the cylinder liners, which are firmly bolted to the cylinder blocks, are attached to the crankcase by means of cylindrical nuts, resulting in a perfect combination of cylinder block and crankcase. In the base of each compression chamber are two inlet and two exhaust valves. The cylinder suction and exhaust chambers are also housed in the cylinder block. Two sparkplugs and one fuel injector are provided for each cylinder. Of the twelve sparkplugs in each cylinder block, six are distributed on the outer side and six on the inner side of the V.

Coolant Entry: 1 nozzle per cylinder block at the rear bottom.

Coolant Outlet: 1 square flange per cylinder block on the exhaust side forward on the

cylinder barrel, to which the steam separator is flange-mounted. The drive control of each cylinder block is sealed off to the outside by an oil-tight cylinder cover. The oil that collects in the cylinder covers is sucked out by a gear pump on each side and pumped into the main oil scavenge pump's collector tank in the rear between the cylinder blocks. At the back end of the cylinder cover is a double drive for the speed sensors. The valves of each row of cylinders are controlled by a camshaft, with each control cam activating one intake and one exhaust valve by means of short rocker arm. Two rocker arms are swing-mounted around a common on one end, while the other free ends are each bolted to an axially adjustable ball socket that contains a flattened ball. With this ball the swing arm rests on the valve stem. The adjustability of the ball socket allows the valve play top to be set.

4) ZF Drive

Intermediate gearing was created to enable the low connection of the generator to the crankshaft in the upper part of the engine casing. The housing consists of grey cast iron and contains the roller bearings for the gear wheels. By means of a billet geared on both sides, one end of which engages the gearing on the end of the crankshaft and the other the upper spur gear, power is transferred via an intermediate gear to the drive wheel mounted in the lower part of the gearing and from there to the generator by means of an intermediate shaft in the form of a torsion bar. Distancing of the crankshaft is achieved by means of ball and adjustable spacer. Driven by the upper gear are two ventilator drive nubs that end in a splined cog and are seated on the ventilator drive shafts. The ventilator drives can be switched on and off. The gearing is lubricated by pressure oil from the engine. The lubricating oil collecting in the lower part is fed back to the engine oil collector tank by a return pump included in the gearing.

5) Equipment Drive

The drive mechanism for the injection pump, supercharger, camshaft, oil and water pumps, fuel pump, auxiliary pump for exhaust cooling, the magneto, and auxiliary equipment is in the equipment casing bolted onto the rear face of the crankcase. Also fitted are 2 Bosch LK 1000/12 generators and 1 special drive containing: 1 auxiliary water pump for exhaust cooling, 1 regulator as rpm limiter, and 1 TEVES star pump for producing pressure oil.

6) Coolant Circulation System (illustration 14 p. 1)

The coolant circulation system feeds the coolant pump, which is a centrifugal pump powered by the equipment drive. The pump casing runs into two outlet connections that are connected to the cylinder blocks' coolant inlet connections by rubber bushings. The coolant is fed from the radiator and coolant reservoir through a suction piece. The gland on the impeller is daubed with coolant pump grease that is squeezed through a grease nipple with the aid of a grease gun. The coolant emerges from the steam separators on the cylinders at the front of the right and left cylinder blocks and flows through the radiator to the recirculation pump. The steam removed by the steam separators is fed through a secondary system of tubes to the coolant reservoir.

7) Coolant Circulation for Exhaust Cooling (illustration 14, p. 2)

A special coolant circulation system is provided for cooling the liquid-cooled exhaust collector pipes independent of the engine coolant circulation system. The system supplies the auxiliary water pump installed on the equipment housing's special drive. It delivers the coolant through the cooling

jackets of the exhaust collectors fitted to the cylinder blocks. One steam separator is attached to each of the adjacent manifolds. The temperature of the coolant is reduced in special coolers and returned to the pump to be circulated again. Cooling air is sucked from the engine compartment through the radiator.

8) Lubricant Circulation (illustration 13)

The lubrication pressure pump draws oil from the oil reservoir—which is separate from the engine—and forces it through the oil filter through the main distributor shaft to the crankshaft, camshaft, the drive, and to the two oil distributors in the equipment casing. Channels drilled in the bearing cover lead from the bearing blocks to the main distributor shaft and provide it with lubricating oil. The big end bearings are also lubricated from this source simultaneously, with the oil being fed through oil trap rings on the crankshaft to the crankpins. Cylinder liners and piston pins are lubricated by splash oil. The oil collects in the feedback channel in the bottom of the crankcase and, depending on the attitude of the engine, flows forward into the equipment casing or backward via the injection pump drive to the oil collector tank in the rear part of the V formed by the cylinders.

9) Fuel System

The fuel flows by gravity from the fuel tanks to the fuel pump. The latter then delivers the fuel via the bleeder to the injection pump to achieve a specific fuel pressure (1.3 to 1.8 kg/cm² [18.5 to 25.6 lbs/in²]). The fuel pump is a gear double pump driven by the pressure oil pump drive via two helical gears. The flow of fuel within the pump is regulated by a control piston. The feed pressure can be adjusted by means of a set screw on the diaphragm case. The pump has a connection for cold start. From the fuel pump, the fuel flows under pressure to the bleeder, which is attached to the mixture controller case by means of a tension band. The fuel-air mixture flows over raised overflow edges into the bleeder compartment. The fuel and air separate when they pass over the overflow edges due to differing specific gravities. The specifically heavier fuel flows down and through a drain aperture to the injection pump. The specifically lighter air collects above in the venting casing and is fed through air holes to a line that leads to the injection pump. The injection pump injects precisely determined quantities of fuel into the cylinder. The air-free fuel coming from the ventilator enters the suction chamber and feeds the twelve pump elements. Excess fuel enters the blowback chamber and is fed back to the ventilator. The amount of fuel injected is controlled by rotation of the piston. A control rod is responsible for the entire control of the pump piston. The actuator box with stop lever is on the drive side of the injection pump. By pulling on this lever, the driver is able to push the control rod to "Stop," shutting down the engine.

10) Supercharging

The purpose of the supercharger is to increase the specific weight of the charged air and thus the charging of the cylinder. This results in a significant increase in engine performance. The supercharger is a single-stage centrifugal blower, essentially consisting of impeller, supercharger cover, and casing. The impeller is powered by the equipment drive via an auxiliary shaft and a hydraulic clutch. A connection flange on the supercharger is envisaged to provide bleed air for special purposes.

11) Ignition System

The fuel mixture in each cylinder is ignited by two sparkplugs that are provided with current by a twin ignition magneto at the top of the equipment casing. A Bosch

12-cylinder twin magneto is used for summer starter ignition, running at half crankshaft revolutions. Magneto, cables, and plugs are equipped with spark protection.

12) Riedel Gasoline Starter

The RBA F10 is a spin-starter with a 10-hp twin-cylinder, two-cycle gasoline engine as its drive source. By gearing, this delivers the necessary torque (maximum 160 mkg [13,887 inlb]) to the engine crankshaft. The engine is started either electrically or manually, and all subsequent processes—switching to advanced ignition, fuel feed control, insertion of the claws, engaging the clutch—take place automatically. When the starter handle is released, all control levers go back to their starting positions.

Flange-mounted directly to the gasoline engine is a triple planetary drive. The rear rim of the drive is held in place by a friction cone that slips when allowable torque (i.e., when the engine backfires) is exceeded. The starter claw is automatically inserted into the engine's counter-claw depending on the speed of the engine starter; therefore, the force connection to the transmission only takes place if the claws have completely engaged. (For fuel information see chapter "Fuel System" under B/10 c.)

10) Fuel System

Illustration 17 (p. 1) provides information concerning fuel storage, delivery and switching, arrangement of equipment and fittings, access to the fuel filler point, and cleaning. The fuel system is divided into four installations for different fuels: 1. Fuel for normal operation of the MB 509 and auxiliary engine; 2. Starter fuel mixture for the Viktoria-Riedel starter engine; 3. Starter fuel for the MB 509 and auxiliary engine; and 4. Acetylene gas in Dissous bottle with line.

a) Tank: The fuel for the MB 509 is carried in the vehicle in two integral main tanks and a jettisonable tank. These tanks are interconnected, and are switchable by means of manually operated valves (illustration 18). The fuel tanks in the left and right side compartments of the hull are held in place by tension bands and rubber-lined suspension tubes, rest on wooden battens and felt strips, and are fitted with crane lugs, transmitter for the fuel gauge, and a screen filter and ventilation system. The jettisonable tank is held in place by latch OKH Device LC18-503.02, which is operated from the turret. At the end of the line to the jettisonable tank is a glass tube that breaks when the tank is jettisoned or separates itself from the tube. Prior to jettisoning, the fuel source must be switched to the integral tanks at the valve batteries. For operation of the fuel system follow the instructions on the information placards for valve batteries and fuel cock, hand pump, and starter pump on the bulkhead between the driver and engine compartments. For filling and venting the lines, the hand pump built into the fuel cock is used before starting the engine.

b) Filter and Fittings: Illustration 17 (p. 1) provides information about the location of the filter, which must be inspected at intervals; the interior structure of the F 16 B lamella filter for the fuel in the jettisonable tank; and the F B H 16 A fuel cock and the KF 1 a filter for the starter fuel, as shown in illustration 17 (p. 2). Valve I (N3 V 16 GJM 4) and Valve II (N2 V 10 Major 4) are shown in illustration 18. The former is used to switch operating fuel from the three large tanks to the MB 509's injection pump and the auxiliary engine's carburetor, while the second directs the starter fuel mixture to the VR starter and acts as an intermediate switch for the auxiliary engine's operating fuel, which is also drawn from the large tanks.

c) Special Fuel Systems for APU Start and Cold Start. The MB 509 gasoline engine can be started in two ways:

1) Starting using the auxiliary power unit.

2) Starting with the Viktoria-Riedel starter. Three fuel systems are provided for this:

a) Starter fuel to MB 509 with tank, manual injection (nebulizer) pump and line; the same (minus nebulizer pump) for starting the Type 241 auxiliary power unit, whose waste cooling air preheats the MB 509's engine compartment.

b) Fuel mixture for the Viktoria-Riedel starter engine.

c) Acetylene gas system for starting in deep cold. The manual injection pump (illustration 19) is used to inject starter fuel in nebulized form for easier starting of the MB 509 even in frosty weather with a cold engine. The pumps (15 and 25 in illustration 17, p. 1) and the starter fuel tank (17/20) are installed on the forward partition in the engine compartment behind the driver's seat. The former deliver fuel from there to the MB 509's suction pipe and it is atomized by the nozzles in the suction pipe. It functions according to the positive displacement principle and sealing of the plunger is accomplished by gland seals consisting of a sealing lip (Wetzel 10057 material) and a cotton spindle string. The pump has a spring-loaded intake valve and a ball exhaust valve. Between the ball exhaust valve and the pump's pressure chamber is a spring-loaded diaphragm valve that prevents fuel from being sucked from the starter fuel tank because of the negative pressure in the suction line through the atomizer and pump when the engine is running. The unit requires no special maintenance; special replacement instructions are provided in chapter E/42 for replacement of a defective spindle string. The Viktoria-Riedel starter engine is used if the electrical starter system through the auxiliary generator motor with electric current fails. A 7 liter [1.85 gal.] tank for the VR engine's starter fuel is in the right side compartment. Assembled with the brake fluid reservoir, it has a head difference of 540 mm [21.26 in.]. The schematic diagram of the mixture tank, lines, filter, valve switch, and starter engine is shown in illustration 17 (p. 1). B4, A2, and A3 aviation fuel with 5% oil addition can be used at normal temperature and at temperatures to -20°C [-4°F]. Starter fuel with 5% oil added is required at temperatures lower than -20° [-4]. When fueling with starter fuel, the tank must be completely emptied. After fueling, bleed lines well and prior to the first start activate the pot magnet by pressing the starter switch for about fifteen seconds to remove any remaining air from the line.

The purpose of the acetylene gas system is to feed an ignitable mixture to the engine in cold temperatures. The system consists of a Dissous gas bottle with pressure regulator installed under the driver's seat and two lines to the MB 509's two suction lines. Gas pressure in the bottle must not go below 2 atm and gas pressure should be 0.5 atm when it flows into the suction line.

11) Engine and Brakes

b) Drive, mechanical element

Reduction Gear and Brakes: The reduction gear transmits drive power from the electric motors (21/3 and 2/4 or 25/19 and 25/20) to the drive sprocket axle through the supporting brake (25/29) and low (hill) gear (25/22). The two-part housing is bolted to the side of the hull with three support points (25/23) and has a lifting lug (26/10) for transport and assembly purposes. Mounted visibly on the reduction gear casing (26/9) are the brake disc bearers (26/11), hydraulic foot brake release (26/12), and the mechanical hand brake release (26/3 or 1/57), as well as an rpm limiter (25/28) for the electric motor, a low-gear shift release (25/29), oil dipstick (25/30), speed sensor (25/31) for the vehicle speed indicator, and the oil pump (25/32). The latter forces the accumulated oil through the oil tube (26/15) up to the first drive sprocket (25/27). The oil pressure cylinder (26/1) with actuating rods for the

operation ring (25/26) is designated disc brake (1/9) foot brake release; when turned by the braking cylinder piston, the latter presses the lamellae and brake disc together axially. The fixed end of the braking cylinder sits in the bearing block (26/2) attached to the reduction gear casing (26/9), and the piston engages the operation ring (25/6) and is moved by auxiliary oil. The latter is controlled by the foot brake lever (2/13 or 2/14) and brake valve and produced by the oil pump (1/57) on the gasoline engine. The oil pressure system is described in more detail in "Foot and Hand Levers." The hand brake release (26/3) affects the operation ring (25/26) via the sector gear piece (26/4) attached to the operation ring. A toothed segment (26/6) mounted on the rocker arm (26/5) engages this gear piece. The rocker arm with the gear segment is mounted in a double lever (26/7). The control cable (26/14) engages the longer part of the double lever that corresponds to the gear ratio. The double lever (26/7) is mounted in the bearing block (26/8) on the reduction gear casing (26/9) and does not release the operation ring with gear section (25/26) until the force from the spring (26/13) releases the brake hand lever (28/1) lock. In all positions, the spring (26/11) presses the toothed segment (26/6) toward the sector gear piece, even when the brake pedal oil pressure system (illustration 29) alone moves the operation ring with sector gear piece (25/26). The reduction gear's oil sump is separated from the planetary gear. The low (hill) gearshift works on the principle of top dead center closure with override clutch sleeve (25/33) and oil pressure operation, and is only to be engaged when the vehicle is stopped.

Sprocket Wheel and Planetary Drive: The drive sprockets are powered via two planetary drives (25/1 and 25/2) and a reduction gear (25/3) with selectable low (hill) gear (25/4). The casings of the two planetary drives (25/1 and 25/2) are used to mount the drive sprockets, with the large spherical roller bearings (25/5) receiving the hollow shaft (25/6), to which are clamped the hub halves (25/7) for the sprockets (25/6). The slaving of the hollow shaft (25/6) takes place through the planetary wheel support (25/9) of the large planetary drive in the inner sidewall (25/10) of the hull. The connection of the large with the small planetary drive is by way of another hollow shaft with pinion (25/11) through the hollow shaft (25/6), with meshing through serrated shaft in the planetary carrier (25/12) of the small planetary gear on the inside of the outer sidewall (25/13). The drive from the reduction gear (25/3) to the small planetary drive (25/2) is accomplished through a drive shaft with pinion (25/14). This shaft is introduced through the hollow shaft with pinion (25/11) with the spline shaft profile in the last cam (25/16) of the reduction gear after opening the cover (25/15) in the outer wall, and with the planetary drive and drive sprocket installed. The use of three flexible shafts makes transmission of motive power less sensitive fit-wise and resilient against abrupt loads. Lubrication is provided by an oil sump to the height of the drive shaft sprocket with pinion (25/14). Oil filling and venting (25/17) are high within the hull near the oil filler (25/18) for the reduction gear (paragraph 11 b).

b. Safety Clutch: this safety clutch is installed with every electric motor and its purpose is to keep impact loads—i.e., when the track is blocked while the vehicle is moving at top speed—from the reduction gear's transmission. The clutch consists of a clutch hub (25/25) on the electric motor shaft (25/34) with a reference diameter with equally distributed holes and tapered insets (25/36), in which steel balls (25/37) under spring pressure engage a second loose clutch plate (25/38). This loose clutch plate is carrier for the connecting shaft between the electric motor (25/40) and the drive reduction gearing (25/41) through the electric motor's hollow armature shaft (25/34). The steel balls ratchet

away over their tapered insets in the loose clutch hub as soon as the circumferential force in the steel ball reference diameter is greater than the sum of the force components from the individual spring pressures. Thus, the connecting shaft is not slid into the drive reduction gear's highest drive wheel (25/27) through an externally closable opening in the armored outer wall until the electric motor and reduction gear unit are completely installed in the vehicle.

12) Running Gear

a) Road Wheels and Suspension

This running gear always uses paired road wheels (1/23)—one behind the other—interlinked by a swing arm (27/2), an elbow guide (27/3) mounted on the swing arm, and a spring (27/4) between the swing arm and guide acting as a support or suspension element. Together with an idler wheel, drive sprocket, and a wide track, six such independently sprung elements, plus another parallel row of six road wheel elements along the outer wall form the running gear on one side of the tank. The hull supports the road wheels against the ground by means of six crossbeams (3/6) per hull side by way of the swing arms or road wheel spring elements. Two suspension elements are attached to each crossbeam. The crossbeams with spring elements are fitted into U-shaped cradle supports (27/6) and secured with hexagonal bolts in the side walls—inside the running gear supporting structure or running gear channel, respectively—and brace the outer sidewall against the hull structure to protect the running gear. Return rollers (27/7) are mounted atop the crossbeams to guide the upper track run. Rubber block stops (27/8 and 27/9) are attached to the swing arm (27/2) and guide (27/3) to limit spring deflection. The fixed end stop (27/10) is in the swing arm spring seat, with the ball pins (27/11) in the spring (27/4) coming to rest in the swing arm at breakthrough. To reduce wear on the track, the road wheels' outer rings (27/13) are braced against the hubs (27/15) by means of clamped (rubber-saving) rubber rings (27/14) and, without removing the rubber insert (27/16), can be installed and removed from the bearing bushings (27/17) of the front and rear trunnions in the guide (27/3). Care must be taken to ensure the spring elements of the inner row are attached to the crossbeams at 180° to those of the outer row.

b) Track

The track has three different links per track element, a main link (27/18) over the entire track width, and for each main link a central connecting link (27/19) and two outer gusset plates (27/20). On the ground side, the shape of the track is almost that of a plate chain. The main and connecting links have cast cleats (27/21) to improve traction; on the main links these run asymmetrically on the outer edge of the track. The main link is positioned in the track so that the smooth surface without cleats faces the inside of the tank. The outer cleats can be replaced by cleats with a higher and angled center rib (27/22) for improved traction on ice. The tank must not be driven on pavement or concrete with these cleats. The main link's base plate is raised and rounded on the outside to improve the vehicle's steerability; this raised surface is provided with openings for installing track bolts. The track bolts (27/3) are headless, and are secured on both sides by flexible steel rings (27/24). The cast main teeth (27/25) on the central link and the cast auxiliary tooth (27/26) on the main link provide lateral guidance and tracking of the vehicle. For slaving and drive of the tracks, tooth spaces are present in the main link corresponding to the tooth pitch of the drive sprocket.

c) Dirt Deflectors

Dirt deflectors are grouped around the drive sprockets at the rear of the tank for the runoff of mud and debris from the track and

road wheels. To clean the track's road wheel surfaces, one deflector (27/32) per track is attached to the casing of the inner planetary drive (27/33) and inner hull sidewall in front of each drive sprocket below sprocket center, plus one dirt deflector (27/34) inside on the outer sidewall to deflect dirt while driving forward or backward. A third dirt deflector per side (27/35) for the right and left track is mounted in the rear of the hull.

d) Idler Wheel and Track Adjustment

The idler wheels that redirect the track are housed in adjustable mountings in the front of the vehicle for tensioning the tracks. The idler wheel axles are mounted in two guide pieces (27/28) and two guide bearings (27/29) that are sealed to keep dirt and water out. The adjustment range is 225 mm [8.86 in.]. Adjustment is made with a special key and by means of an installed gear train (27/30) with a turnable spindle (27/31) on which the guide piece (27/28)—in which the idler wheel axle is mounted—slides into the guide bearing (27/29). When adjusting the track, ensure both idler wheel axle guide bearings are adjusted at the same time.

20 d) Automatic Fire Extinguishing System for Type 205 Armored Fighting Vehicle

Preliminary Notes:

The automatic fire extinguishing system for armored fighting vehicles is a protective system for vehicle and crew. As it is relatively seldom used, errors and faults do not make themselves noticeable during operation of the vehicle as do other items of equipment; they therefore require frequent, particularly careful maintenance and care. Precise knowledge of the manual is necessary to maintain the system's functionality.

A. General

The Type 205 tank's engine compartment fire extinguishing system is an automatic system that uses carbon dioxide as an extinguishing agent. In case of fire or when the temperature in the engine compartment exceeds 160°C [320°F], the system pumps 6 kg [13.23 lb.] of carbon dioxide into the fire area in a matter of seconds, abruptly forcing out the oxygen necessary for combustion and extinguishing the fire. The 6 kg [13.23 lb.] of carbon dioxide extinguishing medium is equivalent to 3,000 liters [792.5 lb.] of free carbon dioxide which, according to trials that have been carried out, is sufficient to ensure a major fire in the enclosed engine compartment is extinguished. The first of the two carbon dioxide bottles is completely emptied during the extinguishing process. When the extinguishing process is completed—meaning after the warning lamp goes out—it is necessary to switch to the spare bottle.

B. Equipment Description

The fire extinguishing system is made up of the following components:

1) 2 carbon dioxide bottles, each with a capacity of 6 kg [13.23 lb.], with electromagnetically operated valve
2) connecting hoses from the bottle valves to the check valves
3) one check valve for each bottle
4) fire fighting line with connection and junction pieces
5) extinguisher nozzles and tubes
6) heat sensor
7) warning light with information placard
8) switch for spare bottle
9) electrical connection lines
10) attachments, bolts, clamps, etc.

1) The carbon dioxide bottles are steel bottles officially certified to 190 atm, with a total capacity of 8.04 liters [2.12 gals]. The electromagnetic valves are screwed firmly onto the bottles and have riser pipes through which liquid carbon dioxide is extracted from the bottle. There is a manual release lever—painted red for improved visibility—on the side of the electromagnetic valves. The hand lever

has a safety pin on a chain to prevent inadvertent operation. Contents of the bottles can be checked by weighing. The empty and full weights are marked on each bottle for this purpose. The carbon dioxide bottles are attached to the vehicle in the vertical position with powerful clips.

2) The connecting hoses between the bottle valves and check valves are attached to the bottles by a special plug coupling, making a tight connection between the bottle and hose possible without the use of a wrench. The plug couplings have a knurled safety sleeve that can be moved with a pulling movement. By sliding this sleeve forward or backward, the safety is disengaged and the plug coupling can either be pulled or attached from the valves. Correct seating of the safety sleeve is indicated when neither of the two red rings visible when sliding the sleeve can be seen.

3) The purpose of the check valves is to prevent carbon dioxide from flowing back into an empty bottle during the extinguishing process. The direction of flow is indicated by an arrow marked on the check valve. The threads on the inlet and exit are also different, eliminating the possibility of confusion.

4.) The extinguisher line consists of 10 mm [0.394 in.] 1w steel tube. It must be positioned so the extinguisher nozzles are supplied with carbon dioxide symmetrically. The pipe sections coming from the main line must therefore be approximately the same length.

5) The extinguisher nozzles have a 3 mm [0.12 in.] diameter. These nozzles lead to a short sprinkler pipe whose purpose is to prevent the escape of air at the carbon dioxide discharge point. As a result, less air is carried along with the stream of carbon dioxide.

6) The system's heat sensors are designed for use in the engine compartment. A bi-metal membrane—its slightly convex surface facing outward—seals the contact housing against the outside. On the inside surface of the membrane there is a contact plate riveted in place opposite a rigid contact rod. Under the influence of heat, the membrane attempts to bend inward against the press-fitted bulge. Not until the critical temperature is reached is the membrane's form resistance abruptly overcome and the membrane suddenly bulges inward. The resulting contact between the contact plate and contact rod closes the current, activating the extinguishing system and causing the warning light to come on. A metal capsule shields the heat sensor's connecting terminals against dirt and damage. On its reverse side this metal capsule has an M 6 threaded coupling and on its side a metal bushing for insertion of the cable. A protective cross is arranged in front of the exposed side to protect the membrane. The heat sensor's housing must have electrical connectivity with the "ground" of the armored fighting vehicle.

7) The warning light indicates the response of the fire extinguisher system and only goes out after the contact making heat sensor has cooled sufficiently. Its purpose is to alert the radio operator to the fact that a fire has broken out in the engine compartment and the engine must be immediately slowed to idle to effectively combat the fire and prevent carbon dioxide from being blown out of the engine compartment too quickly. For this purpose the warning light has a placard that reads: "Fire in engine compartment, go to idle immediately." Failure of the light to extinguish indicates a switching error or a damaged heat sensor.

8) In close proximity to the warning light is the switch for the reserve bottle. This is to be thrown when the warning light goes out after a fire has been extinguished. If the switch is thrown prematurely, the reserve bottle will also immediately empty

itself into the fire area. The switch is to be protected against unintentional activation.

9) The electrical connection lines to the heat sensors should be laid in such a way as to avoid damage in the event of a fire. Heat sensors are connected in pairs, twelve altogether. The connection takes place in the plug into which all of the heat sensor lines are joined. A corresponding socket is inside the vehicle on the front side of the engine. The remaining six heat sensor lines lead to a fuse box in which pairs of heat sensors can be separated from the system by removing fuses. The system's positive terminal is protected by a 15 Amp master fuse.

The extinguishing process or activation of the fire extinguishing system takes place automatically. If a fire breaks out in the engine compartment and the temperature rises to about 160°C [320°F], then the circuit closes in one or more heat sensors, the radio operator's warning light comes on, and the bottles' electromagnetic valves open abruptly. The carbon dioxide is ejected through the extinguisher lines into the engine compartment, exiting in gaseous form. The expulsion of oxygen and the very powerful vortex formed by the carbon dioxide results in the fire being extinguished or smothered. Going out of the red warning light ends the extinguishing process. If the fire extinguishing system fails to activate when a fire breaks out in the engine compartment then the electrical connection is disrupted or there is no current. In this case, the fire extinguishing system must be activated manually. After removing the safety pin, the hand lever on the electromagnetic valve is to be thrown, whereupon the valve is opened mechanically.

1) Illumination of the warning light indicates the outbreak of fire in the engine compartment. The engine must be set to idle or switched off immediately. The engine must be switched off if the vehicle is abandoned.

2) Once the fire is extinguished—which happens automatically—air out the engine compartment well, examine the engine and fuel lines for the cause of the fire, and rectify faults.

3) If fire is noticed before the extinguishing system activates, activate the system manually by throwing the lever on the valve.

C) Manual and Driving Instructions

24.) Putting into and taking out of service.

a) Preparation for driving. Check the following when placing into service and before every drive: fuel supply for the MB 509, VR starter, and the auxiliary power unit—top up if necessary (also add starter fuel during winter operation).

coolant level for engine and exhaust cooling systems,
oil level for MB 509 engine oil and auxiliary power unit,
tracks for damage and broken links, tracks for missing track pin safeties,
tracks for correct tension.
Drainage pumps in OFF position.
Further, all remaining inspection procedures from inspection and cleaning plan 205.00.007 (pp. 48 and 49) are to be carried out.
Are the foot pedals and hand levers easy to operate?
Is the electrical system lighting working properly?
Do all three warning lights go out (2 charging indicator lights for 12 Volt and 48 Volt and 1 changeover light) when engine speed reaches 800 rpm?
Is there pressure in the brake system (60 atm when brake pedal is pushed through)?

b) Starting the Engine.

There are two methods of starting:
Starting with auxiliary power unit
Electric start with Viktoria-Riedel starter or mechanically with VR starter pull cord.

1. Set a valve battery on a main tank.
2. Set main fuel cock to "OPEN."
3. Set Telekin cable lever for radiator grille to "ON."
4. Check to ensure the speed controller is set to "OFF" and the control stick is centered.
5. Turn both battery master switches (12- and 48-Volt) to "ON."
6. Use hand pump to fill fuel lines until indication is seen on the fuel pressure gauge.
7. Engage ignition by pushing the ignition key. Ignition selector switch must be on M 1 + 2 (on the right behind driver).
8. If engine is cold, inject starter fuel with the starter nebulizer pump closely following the instructions on the placard on the suction pipe.
9. Depress foot pedal until slight resistance is felt, about ¼ of the total travel.
10. Push starter button on Instrument Panel 1 and, if necessary, simultaneously inject fuel into the suction pipe again using the starter nebulizer pump.
11. After the engine starts observe the oil pressure gauge. This must indicate pressure within 20—25 seconds of starting, otherwise turn the engine off and check the lubrication system for leaks. Let gas pedal out until idle (approximately 700 rpm) is achieved.
12. Warm up engine by increasing rpm while closely monitoring oil pressure—which must not fall below 0.8 kg/cm² [11.38 lbs/in²] or exceed 7 kg/cm² [99.6 lbs/in²]—until coolant temperature reaches 40°C [104°F] and oil temperature 20° [68°F]. Note: To avoid sparkplug failure during start-up due to fouling or condensation, running the engine at low speed for lengthy periods is to be avoided to the maximum possible extent. Listen to the sound of the engine and observe the exhaust gases. Are the engine and lines losing oil, fuel, or coolant?

Electric Starting with VR Starter

Procedure identical to Points 1-6 under Starting with Auxiliary Power Unit

7. To check for leaks in the MB 509's oil line, place manual starter switch in Position 1 (normal). Press VR starter engine starter switch for ten seconds, then pull until there is an oil pressure indication. If there is pressure then the oil lines are in order.
8. Turn on ignition by pressing the ignition key; ignition selector switch must be in position M 1 + 2.
9. Pull VR starter engine starting switch handle if necessary while operating the nebulizer pump.
10. Depress the foot pedal until slight resistance is felt, about ¼ of the total travel.
11. As above.
12. As above.

Starting with VR Starter Manually with Pull Cord

Procedure identical to Points 1-6 under Starting with Auxiliary Power Unit.

7. Manual start switch to neutral position, press starter switch for ten seconds, then pull and simultaneously start with pull cord. Check for oil pressure indication.
8. As above (switch on ignition . . .).
9. Depress the foot pedal until slight resistance is felt, about ¼ of the total travel.
10. Pull the starting switch handle, simultaneously start with the pull cord and, if necessary, operate the nebulizer pump.
11. As above.
12. As above.

Cold Start (as a rule below -15°C [5°F]) with Acetylene Gas

1. Pressure shown on the high pressure gauge on the gas bottle must be at least 2 atm, otherwise use another bottle or

check to confirm that bottle is not too cold.

2. Open the fuel cock and use the fuel pump to fill the fuel lines to the MB 509.
3. Turn over the engine with the ignition turned off. While the engine is turning over (2-4 revolutions) open the valve on the acetylene bottle's pressure regulator (small hand wheel) for about 3 seconds and allow gas under pressure of 5 atm (low pressure gauge) to flow into the engine. It is useful to set the adjusting screw to about 0.9 atm before opening the valve on the pressure regulator, so when the valve is opened pressure will reach 0.5 atm. Readjust in the event of deviations.
4. After closing the pressure regulator valve, turn on the ignition by pressing the ignition key (ignition selector switch must be set at M 1 + 2).
5. Start the MB 509 with the auxiliary power unit engine (starter button on Instrument Panel 1), or with the VR starter engine electrically with the starting switch handle, or mechanically with the pull cord.

c) Turning Off Engine and Parking Vehicle

Check to ensure that the steering levers are in the neutral position and the separate excitation switch is "OFF."

1. Pull the stop switch and wait until the engine has stopped.
2. Only then switch off the ignition.

d) Special Instructions for Winter Operation

To maintain starting capability and ensure the vehicle can be operated in winter, adjustments must be made to the lubricants and coolant. Information concerning the composition of coolants and lubricants can be found under "Filling Quantities" in chapter A of Technical Information (p. 8). The engine cooling system's coolant is drained at the drain in front of the water pump (photo 14 p. 1) and the small KP equalizing tank is filled with the winter coolant mixture until the level reaches the height of the upper tube plate in the radiator. The exhaust cooling system's coolant is discharged from a special drain in the drain pipe (illustration 14 p. 2) and the equalizing tank is filled with the winter mixture until the fluid level reaches the height of the upper radiator tube plate. For this work, the coolant access cover must be taken off of the hull (illustration 4) and the cover in the hull floor for access to the engine from below must be opened. The engine oil changing procedure is described in lubrication schedule 205.00.007 (p. 41).

25.) Driving Instructions

a) General: Check with engine running:

1. Drive reduction gear oil level at idle.
2. Engine oil pressure must not fall below 1 atmosphere.
3. No canisters, baggage, or the like blocking cooling intakes and outlets.

To be constantly monitored while driving:

1. Engine speed.
2. Oil pressure gauge.
3. Coolant temperature gauge.

The temperature shall not be less than 60°C [140°F], otherwise operate fan flap.

b.) Start: check whether high or low gear is engaged. Only use low gear when driving off-road.

1. Release hand brake.
2. Place both steering levers in the neutral position (end stop with vertical steering lever position).
3. Speed controller to "ON."
4. Press down on the gas pedal to increase engine speed and pull away.
5. To accelerate while driving straight ahead, slowly move both steering levers forward and simultaneously increase engine speed.

c) Driving, Steering, and Braking

The MB 509 engine is to be driven with a

speed of 2,000 rpm. Only when steering and covering difficult sections may engine speed be increased to 2,400 rpm. The installed rev limiter prevents this engine speed from being exceeded. To reduce speed slowly, pull back both steering levers and simultaneously let off on the gas pedal. To stop the vehicle withdraw both steering levers to the neutral position and end stop. When driving straight backward the same process as in 4 and 5 applies, but both steering levers—while pressing the push buttons in the steering levers—are slowly pulled back through center to the end stop. On this vehicle steering and braking are a purely electric procedure and the hydraulic brakes are only used as auxiliary brakes. Note: make turns as wide as possible.
Forward left turn: right steering lever forward through middle "STOP" or left steering lever back and apply left foot brake to assist.
Forward right turn: left steering lever forward through middle "STOP" or right steering lever back and apply right foot brake to assist.
The speed of the vehicle is controlled by operating the gas pedal and the steering levers in the driver's position. When there is no threat of fire, the entry hatch (1/17 and illustration 4) are open and the driver's seat, which is built as a lift seat, can be raised to maximum height by the driver so that with a clear view over the hull of the vehicle he can easily control the vehicle using the steering levers and gas pedal while observing terrain unhindered. Under fire and in action, the driver's lift seat is lowered to the hull floor and the entry hatch is closed. The driver has a periscope with a glass prism in the hull roof with which to observe the terrain in front of the vehicle. For observing the surrounding terrain there is a periscope-like panoramic device in the hull roof above the radio operator.
Control of the Maus is simplified, in that the turning/steering levers are also shift levers. The only gear selections are high (road) and low (hill), though either can be selected when the vehicle is stationary using the gear shift lever (1/15).
The vehicle's great weight demands special attention when crossing bridges, cobblestone streets, railway tracks, soft roads with deep ruts (ground clearance 570 mm [22.4 in.]), trails, when driving over fallen trees, broken walls, obstacles (with underlaid tree trunks), climbing obstacles, and up and down steep slopes—especially in snow and ice—during loading and transport.

d) Shutting Down the Vehicle

1. Steering levers to "zero" position
2. Driving master switch to "OFF"
3. Allow the engine to run at idle for at least two minutes
4. Pull stop switch and wait until the engine stops
5. Turn off ignition
6. Apply hand brake
7. Both battery master switches (12- and 48-Volt) to "OFF"
8. Close fuel cock = master fuel cock

(Concerning the following table see illustration 40, p. 209)

PzKfw. Maus			Inspection Schedule
After each km	No.	Material, Remarks	Care areas and explanations, area to be Inspected
Daily	1	Engine oil	Measure oil in reservoir with dipstick, min. amount 50 liters [13.2 gals]
	2	2 caps, l. and r.	Check coolant level, top up radiator to top of tube plate
	3	2 caps, l. and r.	Check exhaust coolant level, top up as above
			Check coolant system fittings for leaks
	4	OZ 74	Check fuel level with gauge or in tanks
	5	Engine oil	Check auxiliary power unit oil level with dipstick (accessible from turret)
	6	Starter fuel RLM mixture	Check fuel level for Riedel starter engine, ventilate lines well when adding fuel (pot magnet)
	7		Check road wheels rubber rings, ensure 15 mm [0.59 in.] spacing between clamp discs and outer rings.
	8		Starter fuel for auxiliary power unit (winter operation only)
	9		Check road wheels bolts
	19		Check for damaged track links and bolts, replace missing pins, correct track tension between drive sprocket and first road wheel, check hose connections and fittings (engine) for leaks.
250	10	Gear oil	Oil level on reduction gear oil dipstick
	11		Oil pressure system, check oil level
	12		Battery, acid level 10 mm [0.394 in.] over plates, keep holes on mounts open—acid density—keep battery clamps lightly greased. Monitor fuel consumption on a regular basis
	13		Look for metal abrasion on engine oil filter
500	14		Reduction gear oil level to notch in dipstick. Top up as required
	15	Gear oil	Top up planetary drive oil level until overflow at the check screw
			Generator brushes, minimum brush length in mm, whether brush guide is in order, brush pressure (0.7 kg [1.54 lb.]), damage to brushes and proper fit on the collector, brush holder gap 2–2.5 mm [0.079–0.098 in.] to collector. For electric motors
	35		Brake adjustment is automatic
	17	Gear oil	Fan drive left and right, add oil and check level with dipstick.
		Gear oil	Drainage pump drive top up to mark
			Check injection lines on engine for tightness and cracks

1000			Check sparkplug gaps, adjust ground electrode with bending tool, recheck with gap tool.
			Engine idle speed approx. 700 rpm when engine warm
			Check screening tube fittings by hand, if necessary tighten stud screws on the engine supercharger casing
			Valve play and ignition timing
			Check for leaks and proper attachment: equipment casing with all attachments, reduction gear casing, crankcase cover, cylinder head, boost pressure line, oil and fuel lines, compression check for each cylinder
			Check for leaks all hatches and covers with rubber seals
Cleaning Schedule illustration 40 (see p. 209)			
			If vehicle has sat for a long period; remove condensation from inside of sparkplug suppressors and hoses, check tightness of sparkplug suppressors with feeler gauge daily
Daily	19		Clean track links
250-350			Clean sparkplugs with plug cleaner or small piece of wood, or wash out with fuel and stiff brush and dry immediately. Access via cover in floor of hull
	20		Clean air filter
	21		Clean fuel cock filter; close cock; unscrew tensioning screw in base of filter housing to the left; move clamp to the side and remove housing; remove filter and clean, also housing; during reassembly check seal and tighten tensioning screw firmly by hand (without tool).
			Sparkplugs for auxiliary gasoline engine
500			Clean fuel injection pump, check seals during reassembly
	22		Clean fuel filter for external fuel tank
	23		Clean fuel filter for starter fuel (VR engine)
	24		Fuel filter for auxiliary gasoline engine
	25		Air filter for auxiliary gasoline engine
1000	26		Oil filter for auxiliary gasoline engine
	13		Clean oil filter for MB 509; remove filter insert and wash; drain oil sludge from housing. Clean lift seat, steering lever and driving switch actuators
2000	27		Clean reduction gear oil filter and remove sludge, flush out MB 509 fuel pumps, clean nozzles and lines
By kilometer	No.	Material, Remarks	**Lubrication Schedule (see p. 209)**

250	28	Grease	Clean road wheels grease nipple, inject grease until grease collar forms, 48 lubrication points
	29	Grease	Carrier bolts - as above, 24 lubrication points
	31	Grease	Drive wheels - as above (roller bearing model), 4 lubrication points
	32	Gear Oil	Drive wheels, top up oil (slide bearing model), 4 lubrication points
	33	Grease (Calypsol)	Inject grease into nipple on coolant pump. In the event of leak in water pump, adjust worm shaft and secure again
500	34	Grease	Inject grease into nipple on fan drive, 6 lubrication points
	19	Waste oil-kerosene	Lubricate track links and bolts
		Mixture 1 : 1	
	30	Grease	Support rollers, clean grease nipple, inject grease until grease collar forms, 24 lubrication points
1000		Gear Oil	Lubricate lift seat, steering lever and drive switch actuators
		Inteva-Rotring	MB 509 oil change (only in severe dust, tropics and the East), procedures see 2,000 km [1,243 miles]
		Engine Oil	
		Gear Oil	Oil brake pedal, gas pedal, hand brake lever and all actuator rods, 4 grease nipples
2000	18	Inteva-Rotring	MB 509 engine oil change; warm engine drain oil from cap in floor of armored hull - drain engine through oil drain screw on bottom by radiator outlet - for radiator through the unscrewed hoses - for tank through hose to oil entry on engine - for tank riser pipe and 2nd half of oil cooler, open connection on bypass valve - turn over engine with starter (ignition switched off) - close caps and lines again - add oil through lubricating oil filler neck - check oil level at 1,000 rpm - close filler opening and cap on hull floor.
2500	27	Gear Oil	Drive reduction gear oil change; drain oil at prefilter, remove screen filter - (clean filter) - drain oil - add fresh oil through vent.
	36	Gear Oil	Planetary drive oil change; drain oil through drain screw; add oil through vent.
		Gear Oil	Oil change in both fan drives; drain oil through drain screw hole; fill through vent.
	38	Grease	Drive shaft for fan drive, apply grease using grease nipples; 6 grease nipples.
		Grease	Lubricate electrical system bearings with grease, also hand brake lever and brake release on reduction gear

5000		Gear Oil	Oil hinge bearings on all hull caps
	4	Grease	Overhaul and grease safety coupling on the electric motors.
	40	Engine Oil	Auxiliary gasoline engine oil change during change from summer to winter operation and reverse.
At mileage:			After break-in change oil and clean filter in:
50			Fan drive
250			Drive reduction gear and planetary drive Clean and grease safety clutch

Gear Oil = Wehrmacht gear oil 8 E
Engine Oil = Intava-Rotring
Grease = Standard lubricating grease

Pressure Oil for gas pedal = Shell AB 11 or standard army shock absorber oil

27.) Engine and Accessories

General handling and servicing guidelines.

Removal of protective materials from the coolant spaces is done with clean water simultaneously with the first test run. After removal of the exhaust sealing cap, copper asbestos gaskets, and sparkplugs with gaskets, the valve stems are to be slashed with a 1 : 1 mixture of engine oil and kerosene with valves open. To remove residual protective oil from the cylinders, the engine is to be turned in the trestle so first one and then the other row of exhaust openings is positioned vertically beneath the axis of the engine. Then turn the engine slowly until no more oil drips out of the exhaust and sparkplug openings. To avoid liquid knocking, remove the drain plugs on the bottom of the charge air line and drain any protective oil remnants. All lines, rubber components, and hose connections are to be checked to ensure there are no flaws. In particular, make sure no cracks have developed. Wash the sparkplugs with pure gasoline and dry immediately. A rag dipped in kerosene is to be used to clean the engine exterior. Gasoline or benzene must not be used, as they attack the light metal's protective finish and the rubber bushings.

Maintenance after every driving day

Check fuel line fittings for leaks. The ratchet for oil filter cleaning is activated automatically because the ratchet is connected to the lift seat mechanism. Check engine cables and oil lines for oil leaks. Failure to identify leaks in the oil circulation system can have serious consequences. Moisten the exhaust valves with an injection of kerosene. (Only accessible through the floor cap in the hull floor beneath the engine.) Service after every fifty hours of operation. Check for bronze shavings in the fuel filter. The fuel tank sump and filter should also be cleaned. Unscrew plugs with gaskets from the filter housing. Drain the filter sump and reinstall the plug with gasket. Remove the oil filter and clean in gasoline. If metal abrasion is found then the engine must be returned to the manufacturer. Clean the fuel filter. After removing the coupling nut, unscrew sparkplugs with gaskets and preclean fouled sparkplugs undismantled in gasoline. Afterward, treat sparkplugs with Bosch sandblaster if possible. Replace damaged sparkplugs. Inspect and oil all items. Check to see if the stud screws for attaching the supercharger housing to the engine casing have loosened. Tighten if necessary. Examine fuel injector rails for tightness and cracks. Check supercharger impeller for cracks.

(36) d. Checking the Fire Extinguishing System after Installation

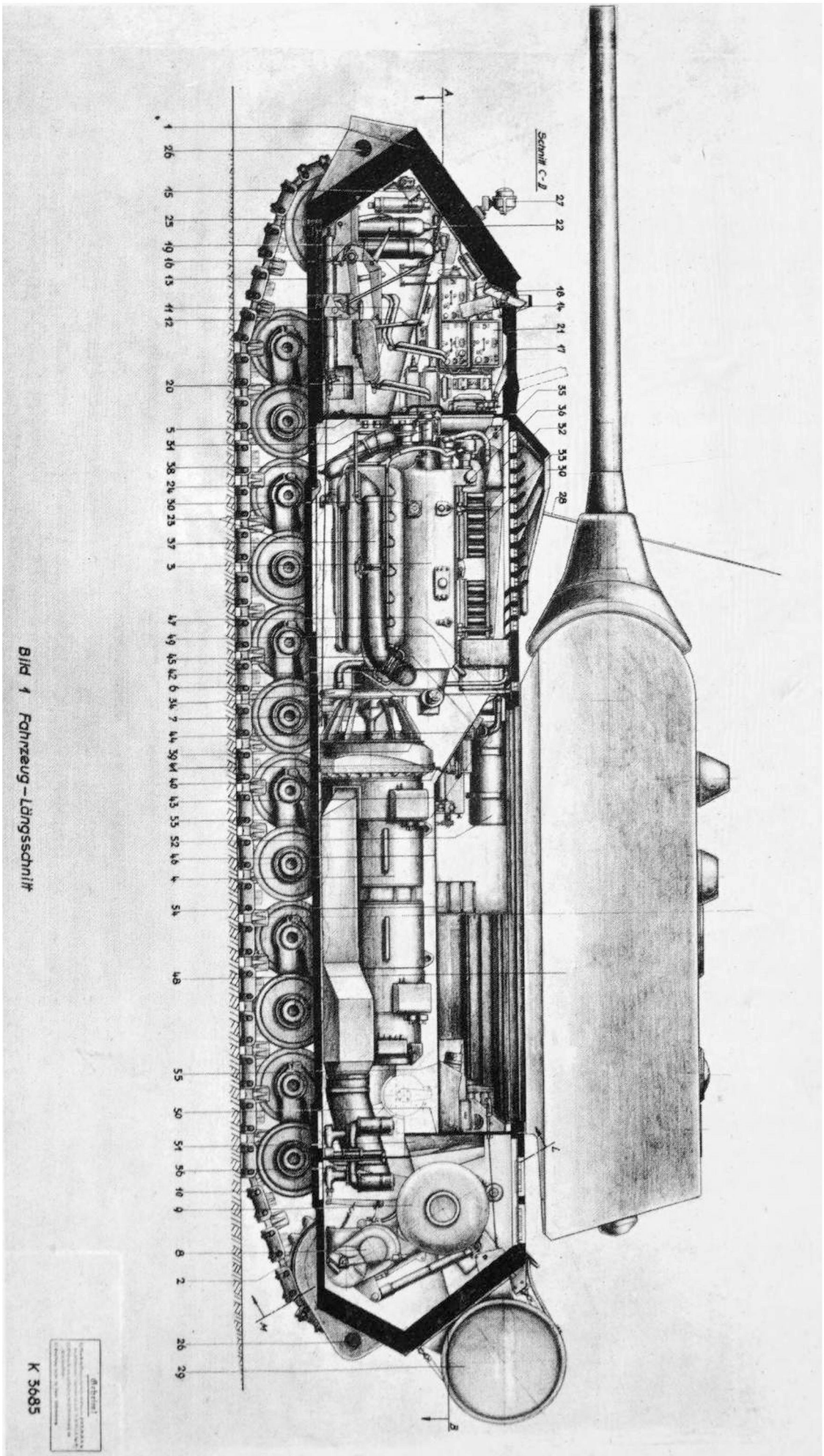
After installation is completed, check the heat sensor for response. This is best done with an electric heater employed on every single heat sensor.

Checking the extinguishing agent tank: the contents of the carbon dioxide bottles are to be checked at regular intervals. For this the bottles are removed by pulling out the plug couplings and the electric connecting plug. The carbon dioxide bottles are then weighed with a spring scale. If more than 600 grams [21.2 oz] have been lost the bottle must be exchanged for a new one. The carbon dioxide bottles cannot be filled in the field; they must be sent back to a properly set-up carbon dioxide filling station.

(42.) Instructions for installing a spindle string with a 3.5 mm [0.14 in.] diameter approximately 105–110 mm [4.13–4.33 in.] long.

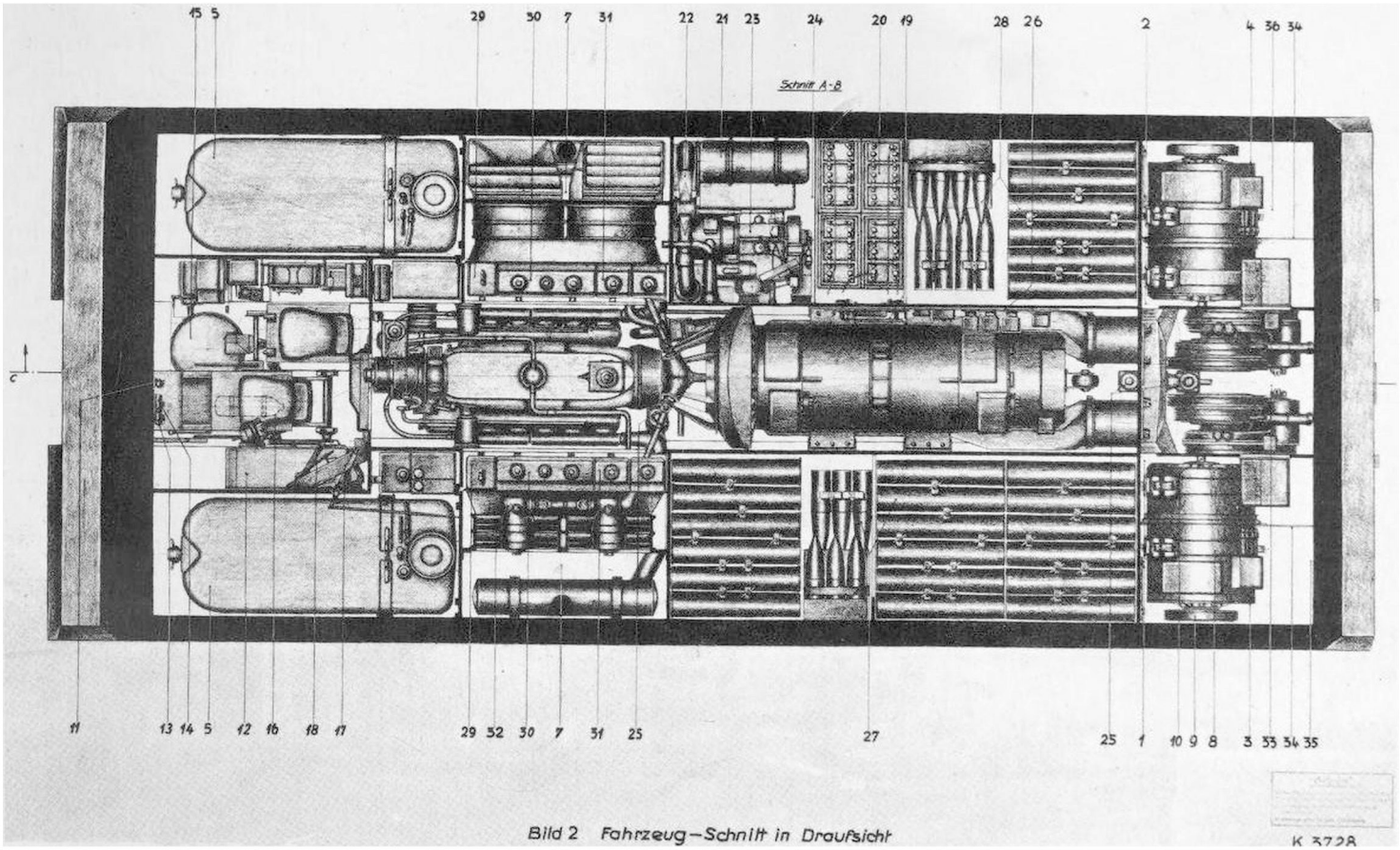
Remove the guide nut by hand and extract the pump tappet. Insert a spindle string between the upper and lower pressure ring as shown in the diagram (right hand wound, ends moistened). After inserting the string, reinsert the pump tappet and screw on the guide nut by hand. Ensure the spindle string lies flat on the tappet and is not jammed between the upper pressure ring and the pump housing.

Illustration 1



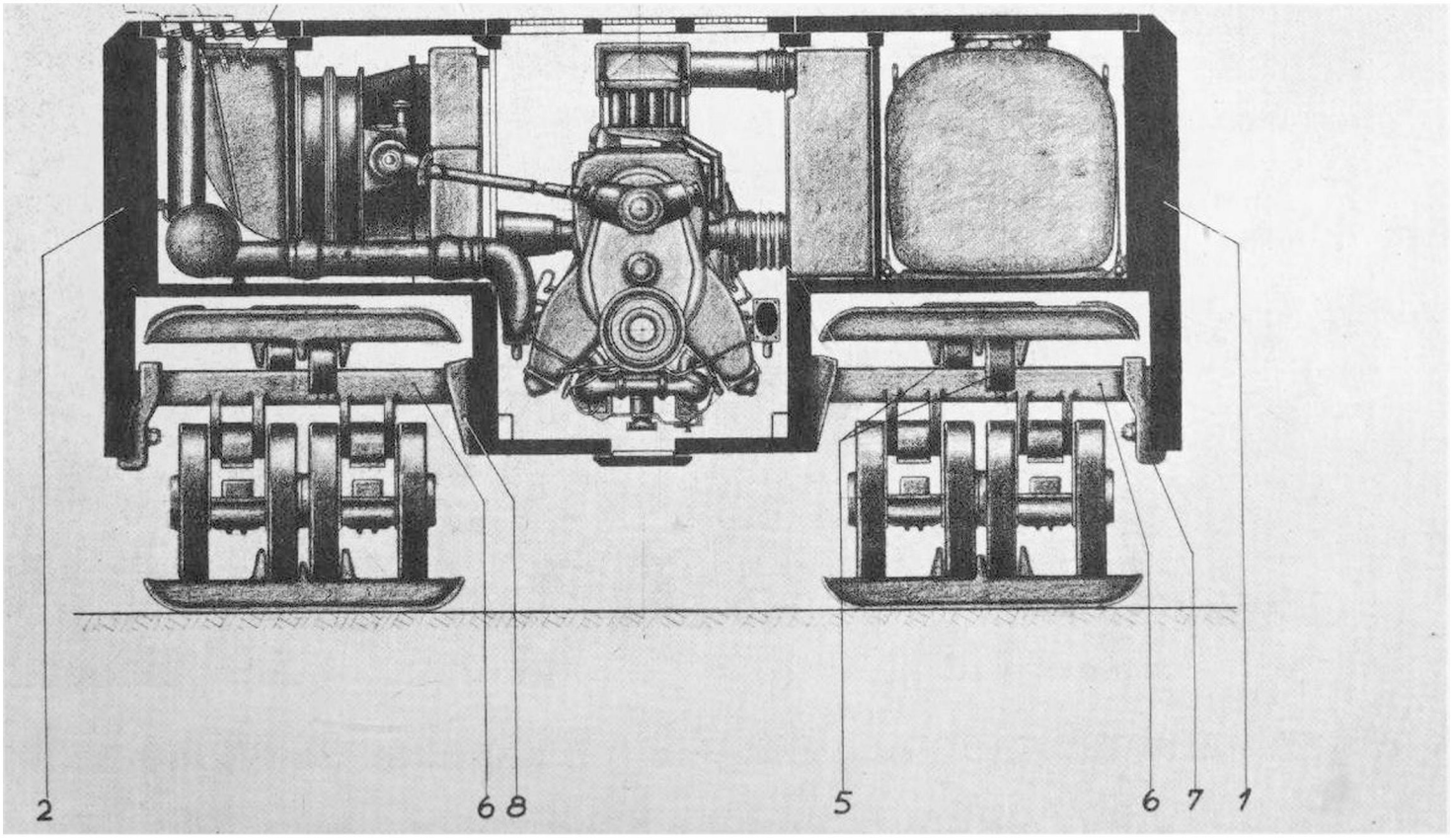
Vehicle - longitudinal section.

Illustration 2



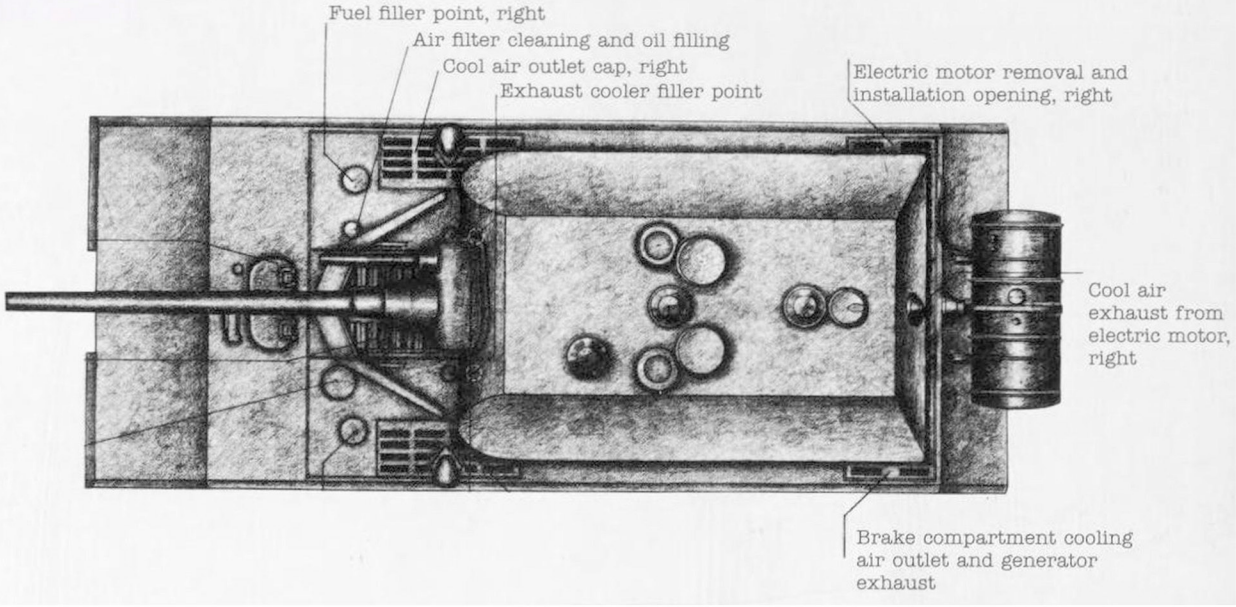
Vehicle in overhead cross section

Illustration 3



Vehicle cross section.

Vehicle—overhead view.


Fuel filler point, right
Air filter cleaning and oil filling
Cool air outlet cap, right
Exhaust cooler filler point
Electric motor removal and installation opening, right
Cool air exhaust from electric motor, right
Brake compartment cooling air outlet and generator exhaust

Sideview:

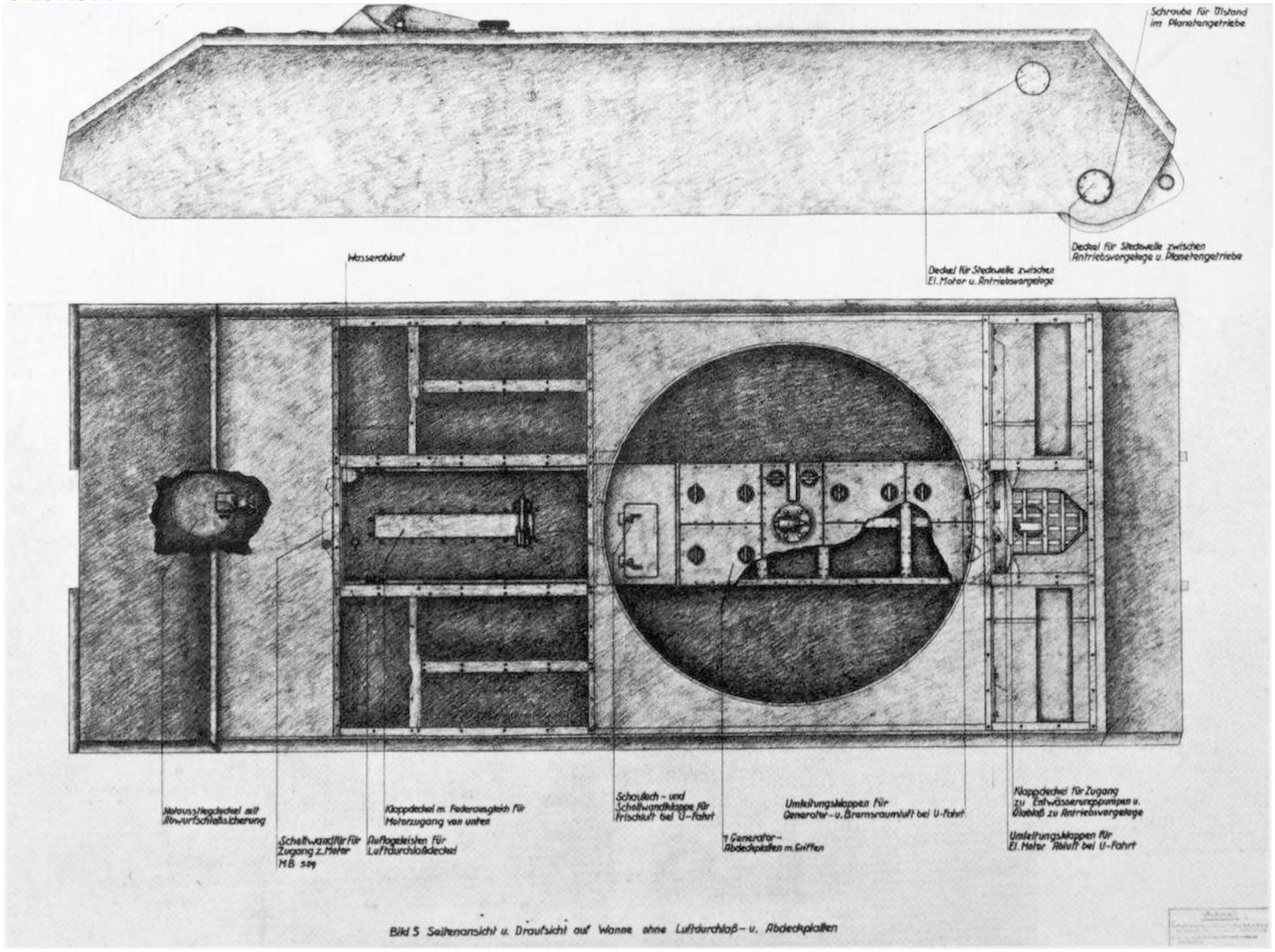

Schraube für Ölstand im Planetengetriebe
Deckel für Stichwelle zwischen Antriebsvorgelege u. Planetengetriebe
Deckel für Stichwelle zwischen El. Motor u. Antriebsvorgelege
Wasserablauf
Motorausstiegdeckel mit Abwurfschlitzsicherung
Schellwasserstift für Zugang z. Motor MB 509
Klappdeckel m. Federausgleich für Motorzugang von unten
Auflageleisten für Luftdurchlaßdeckel
Schaulach- und Schallwandklappe für Frischluft bei U-Fahrt
Umleitungsklappen für Generator- u. Bremsraumluft bei U-Fahrt
7 Generator-Abdeckplatten m. Griffen
Klappdeckel für Zugang zu Entwässerungspumpen u. Ablaßkl. zu Antriebsvorgelege
Umleitungsklappen für El. Motor Abluft bei U-Fahrt

Bild 5 Seitenansicht u. Draufsicht auf Wanne ohne Luftdurchlaß- u. Abdeckplatten

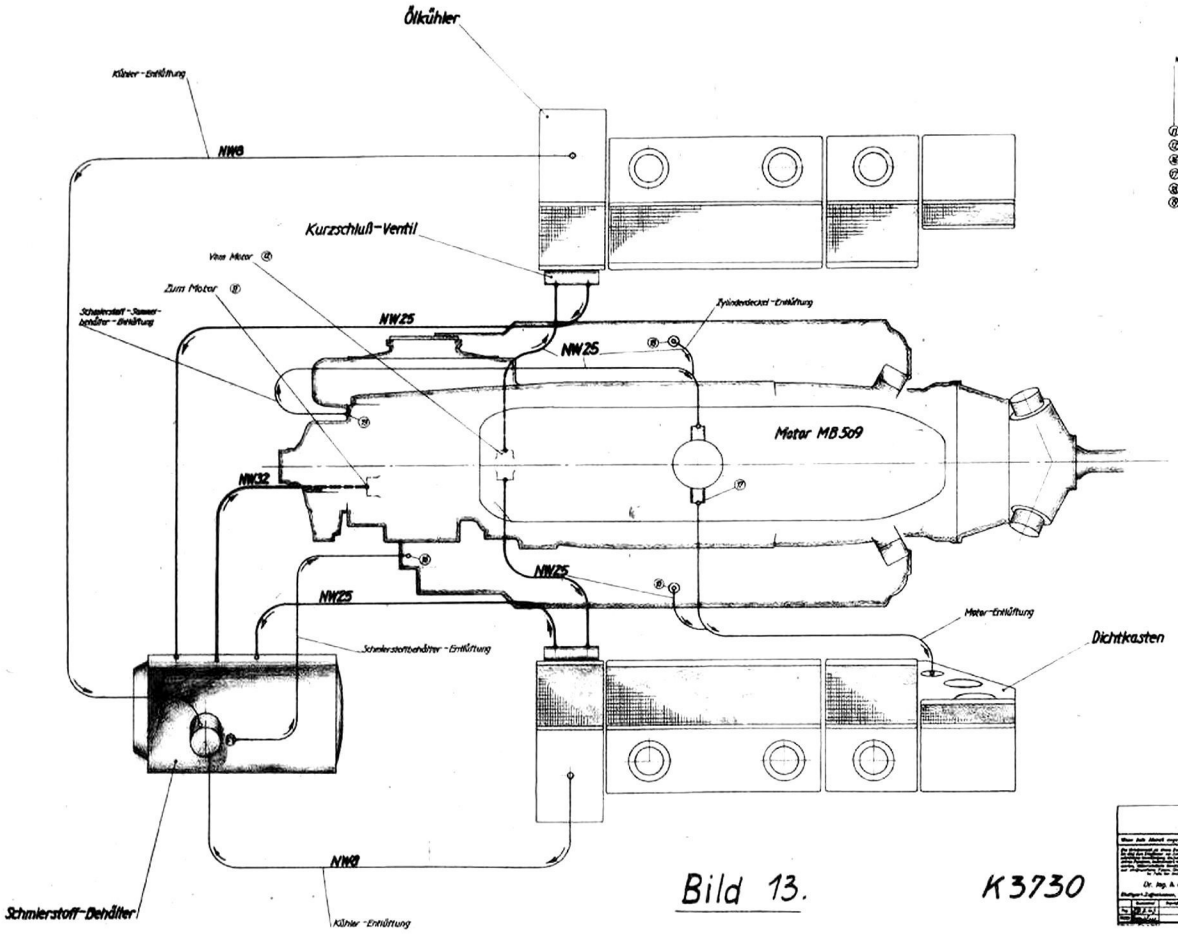


Bild 13. K3730

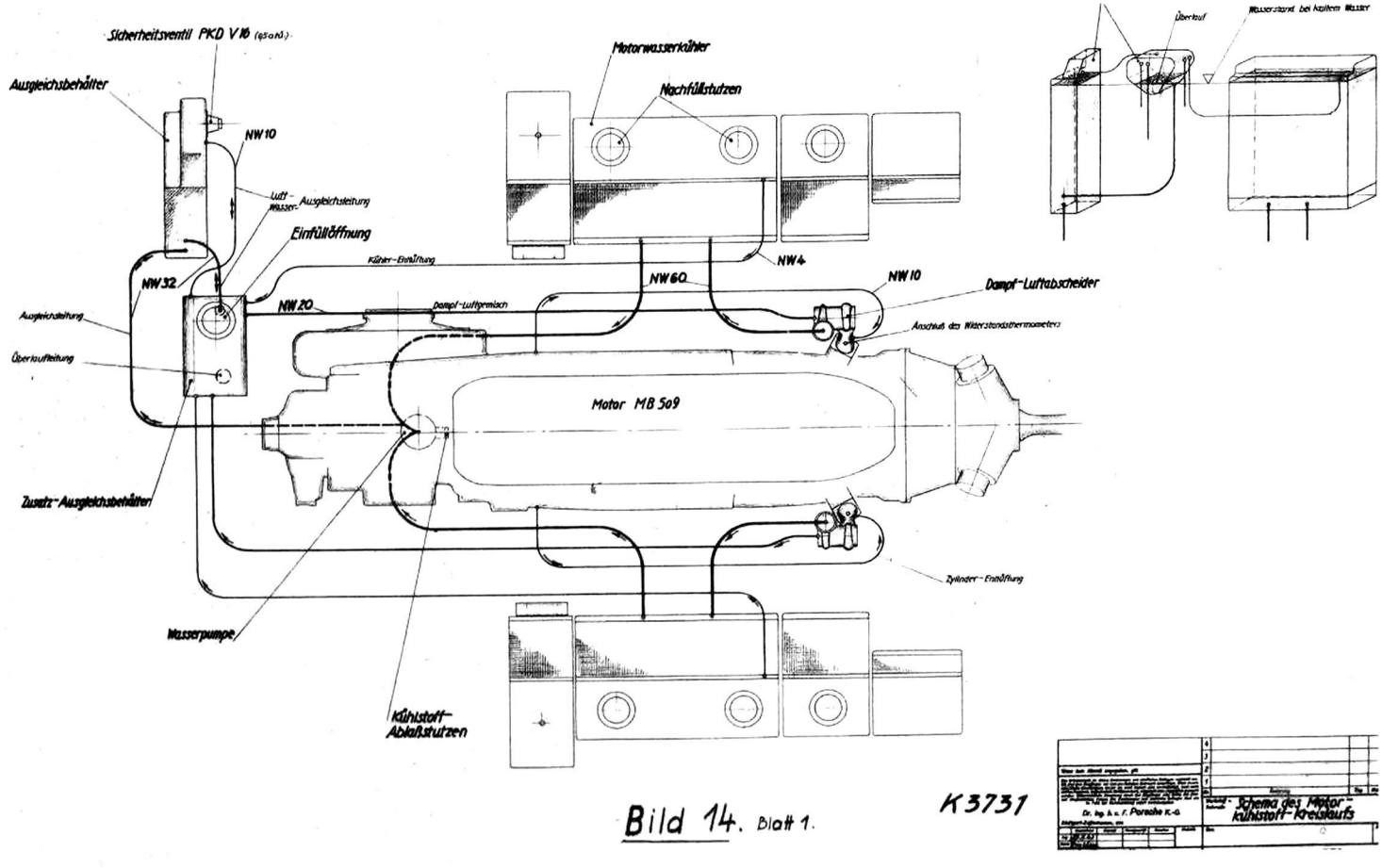
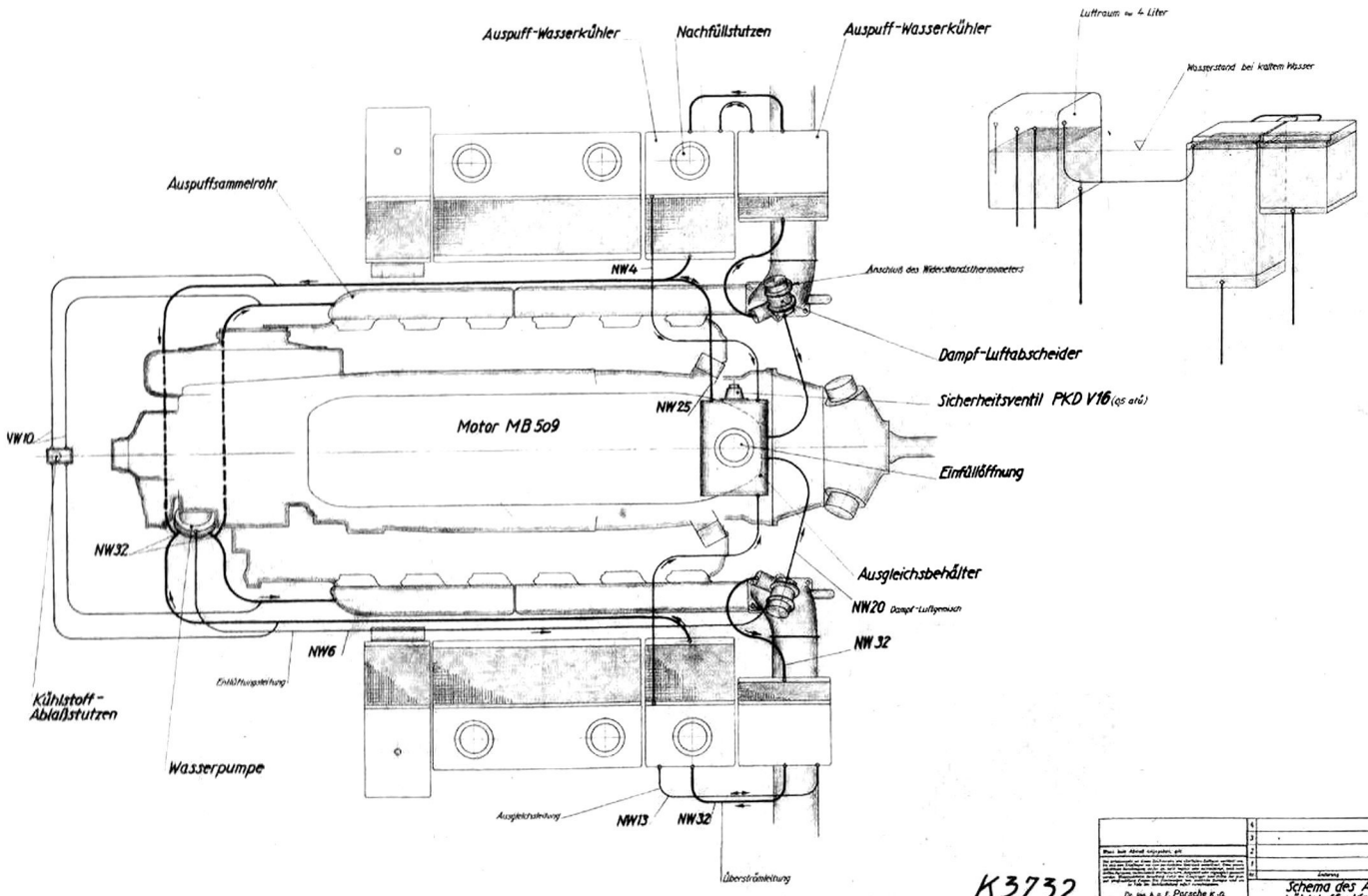


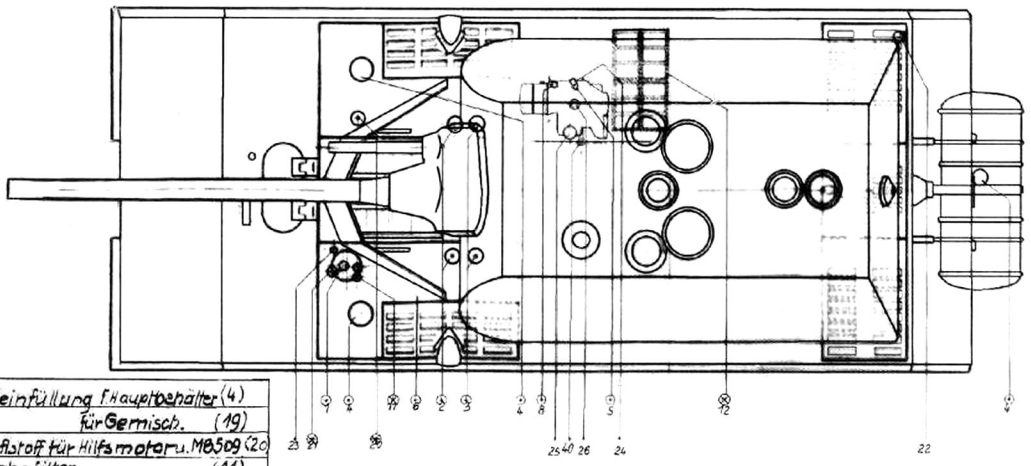
Bild 14. Blatt 1. K3731



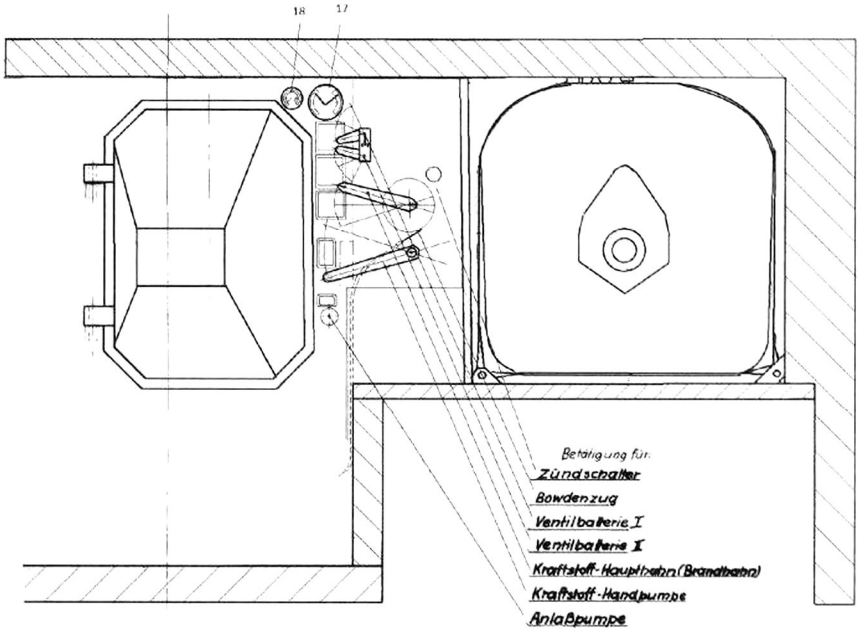
K3732

Schema des Auspuff-kühlstoff-Kreislaufs

Bild 14. Blatt 2.



4.	Kraftstoffeinfüllung f. Hauptbehälter (4)
6.	" für Gemisch. (19)
8.	Anlaßkraftstoff für Hilfsmotor u. M 8509 (20)
21.	Brandhahn filter (11)
22.	Kraftstoffilter für Abwurfbehälter (13)
23.	Kraftstoffilter für V.R. Anlaßkr. Gemisch (12)
24.	" " Hilfsaltomotor.
Die Klammerzahlen entsprechen den Schema-Nr.	



Trennwand-Ansicht

Kraftstoffanlage — Schema

Nr.	Benennung	Nr.	Benennung
1	Kraftstoffbehälter rechts 600 l	20	Anlaßkraftstoffbehälter 1 l 2 Stück
2	Kraftstoffbehälter links 600 l	21	Betätigung - Ventilbatterie I
3	Kraftstoff - Abwurfbehälter 1000 l	22	Betätigung - Ventilbatterie II
4	Kraftstoff - Einfüllung	23	Betätigung - Brandhahn, Zündschalter, Einspritzpumpe
5	Entlüftungsventil und Anschluß	24	Betätigung - Kraftstoff - Handpumpe
6	Inhaltsanzeiger - Geber	25	Betätigung - Anlaßpumpe
7	Leitungsanschluß	26	Absperr - Ventil
8	Entlüftungsventil	27	Einspritzpumpe
9	Ventilbatterie I	28	Saugrohr rechts
10	Ventilbatterie II	29	Saugrohr links
11	Brandhahn (Kraftstoffabsperrung)	30	Hilfsmotor
12	Filter für Anlaßkraftstoffbehälter	31	Zündschalter
13	Filter für Abwurfbehälter	32	V.R. Anlassermotor
14	2-Weg-Hahn mit Hubsteuerung	33	Kraftstoffförderpumpe am Hauptmotor
15	Anlaßpumpe	34	Kraftstoffförderpumpe am Hilfsmotor
16	Dissousgasflasche	35	Bremsölbehälter 11 l
17	Kraftstoffmenge - Uhr	36	Inhaltsanzeigestab
18	Kraftstoff - Druckmesser		
19	Anlaßkraftstoffbehälter 7 l		

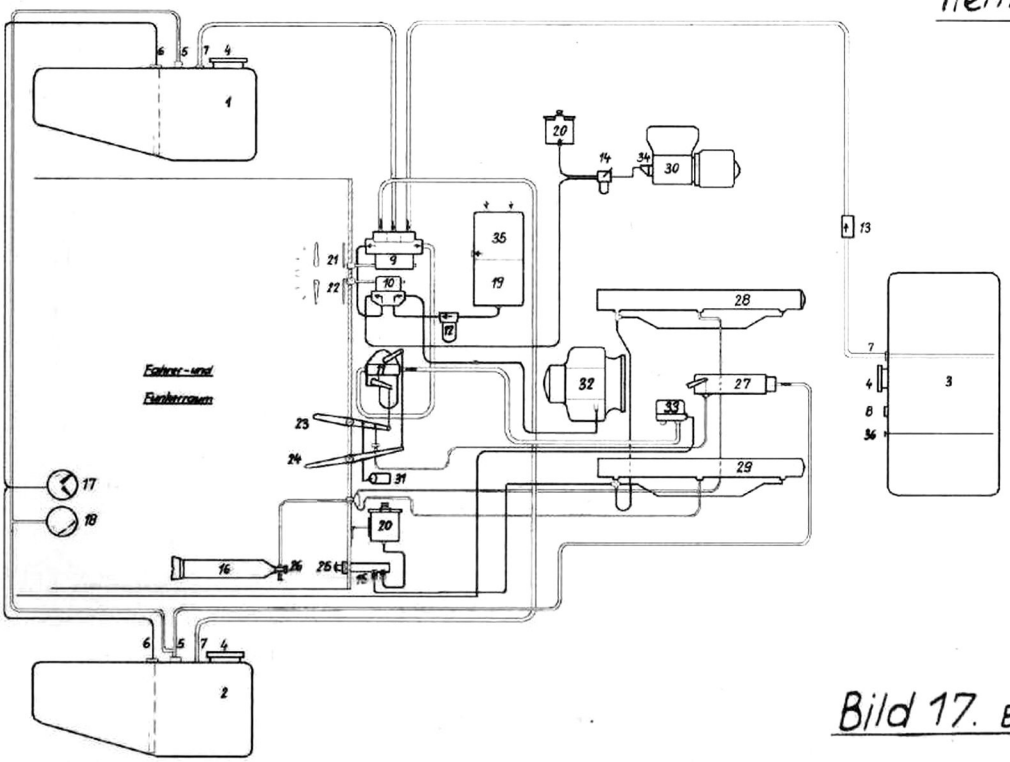
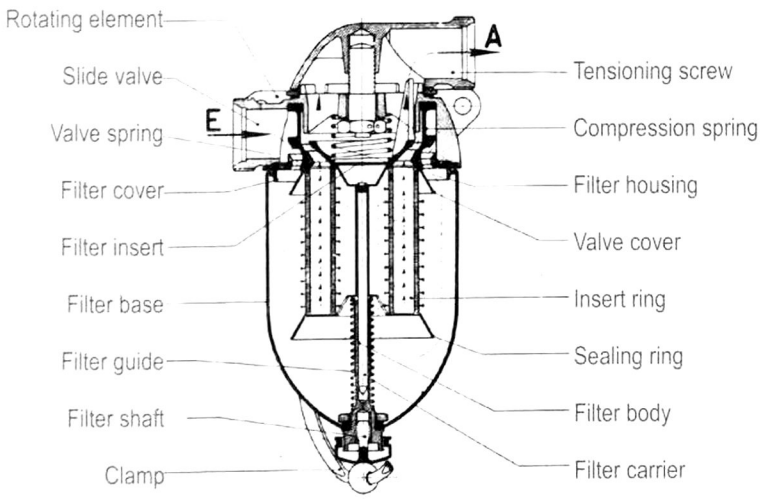
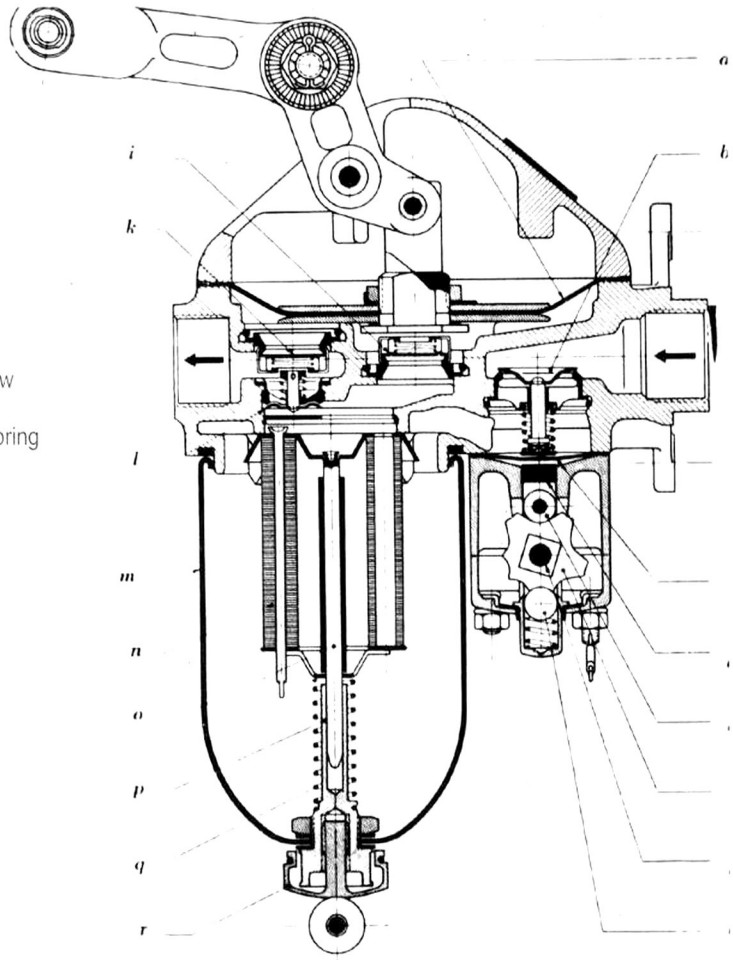


Bild 17. Blatt 1

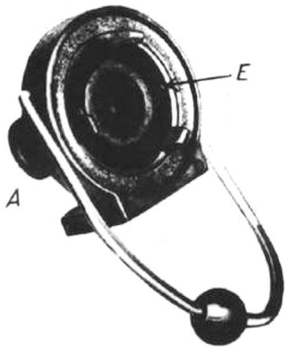


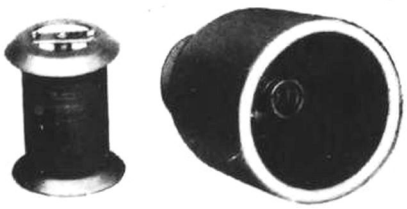
Cross-section of F 16 B Filter (beginning after the "A" above arrowhead, then clockwise)



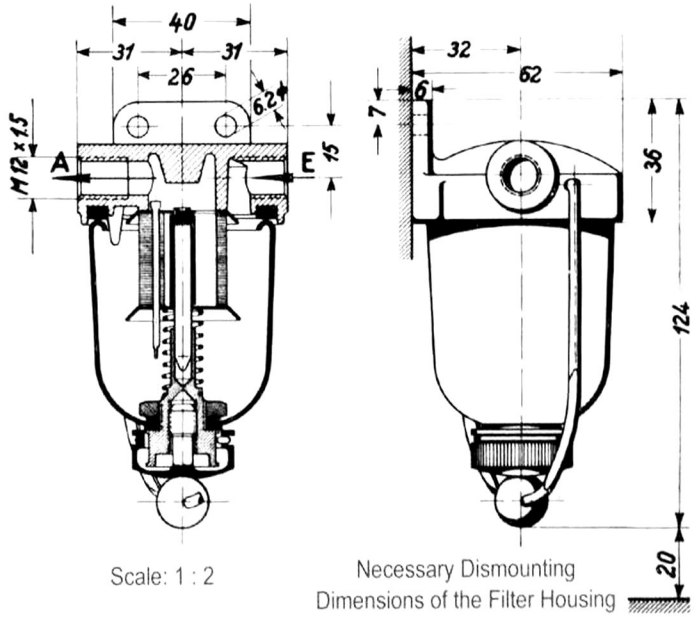
a Hand-operated pumps diaphragm
b Valve
c Valve diaphragm
d Valve tappet
e Tappet roller
f Cam disc
g Selector shaft
h Ball catch
i Suction valve
k Pressure valve
l Overflow valve
m Filter housing
n Filter insert
o Filter shaft
p Filter guide
q Filter spring
r Tensioning screw

Cross-Section of FBH 1 Filter – Fuel Cock – Valve: [Scale 1 : 2]





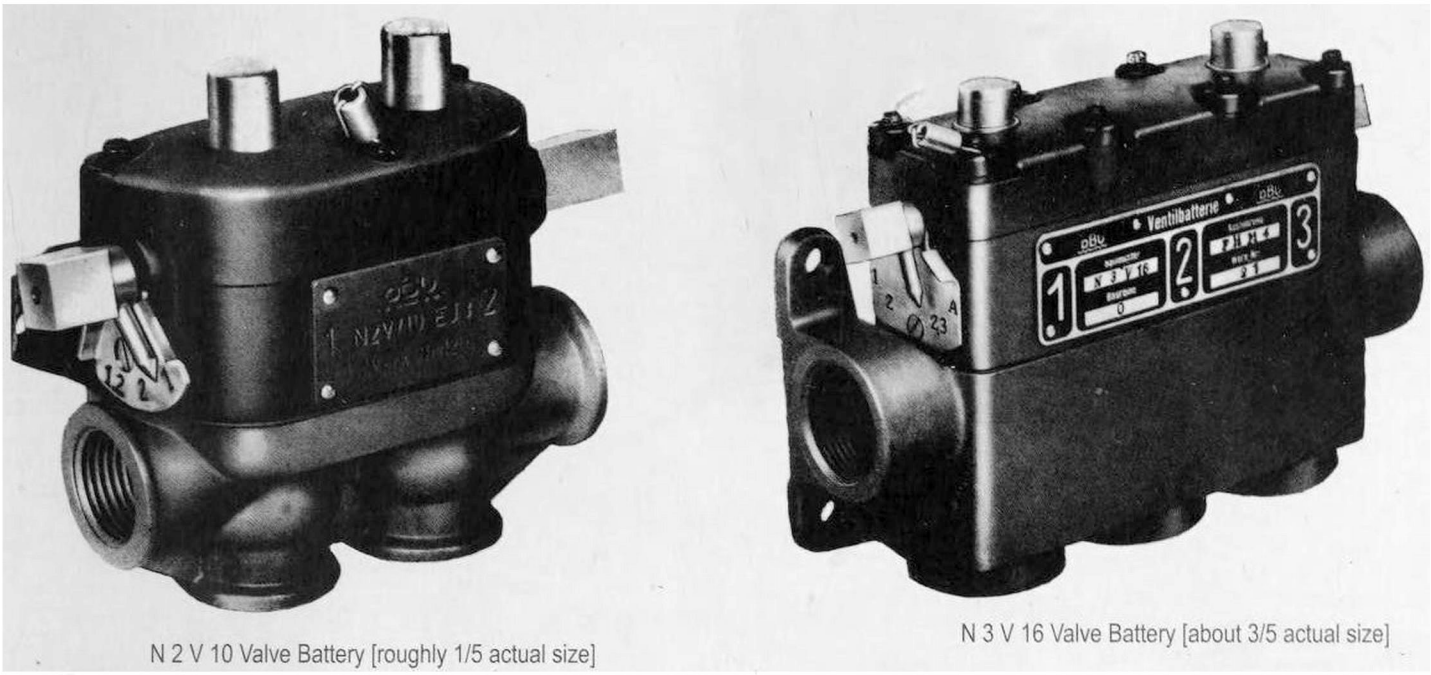
Main Parts of KF 1 Filter



Scale: 1 : 2

Necessary Dismounting Dimensions of the Filter Housing

Cross-Section and Installation Dimensions of the KF 1 Filter



N 2 V 10 Valve Battery [roughly 1/5 actual size]

N 3 V 16 Valve Battery [about 3/5 actual size]

Longitudinal and Cross Section of an N 3 V 16 Valve Battery [scale 1 : 2]

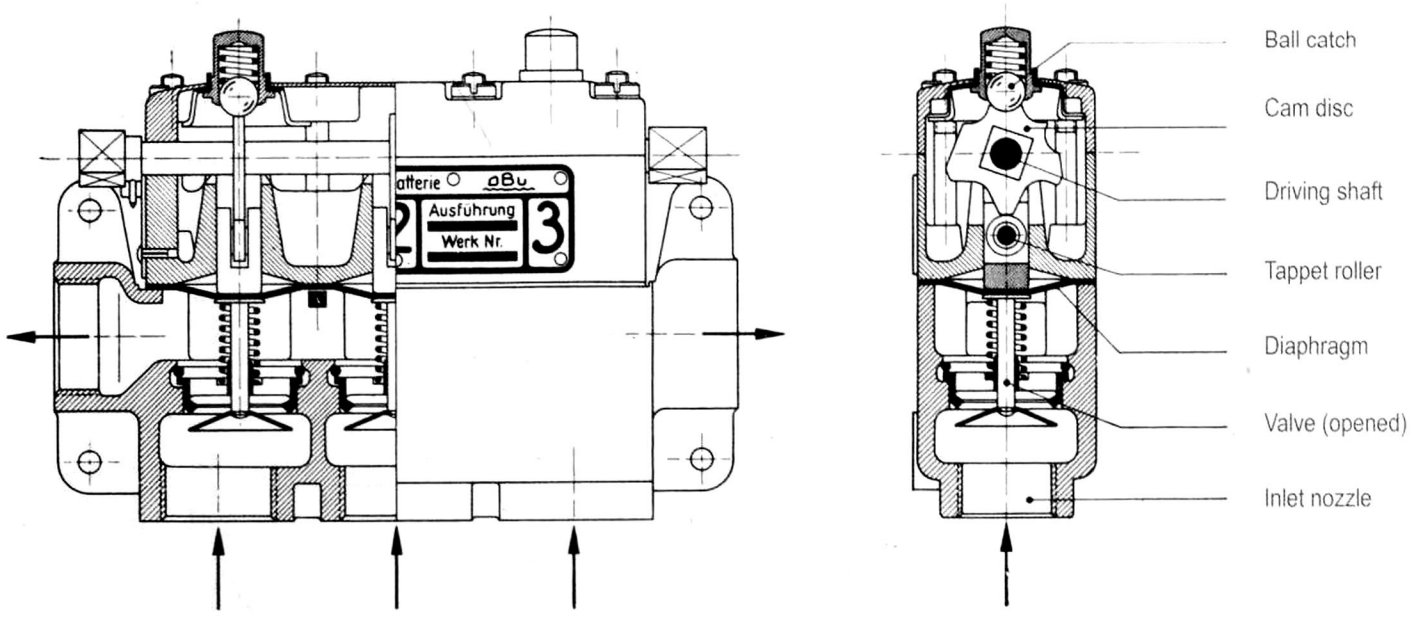


Illustration 18

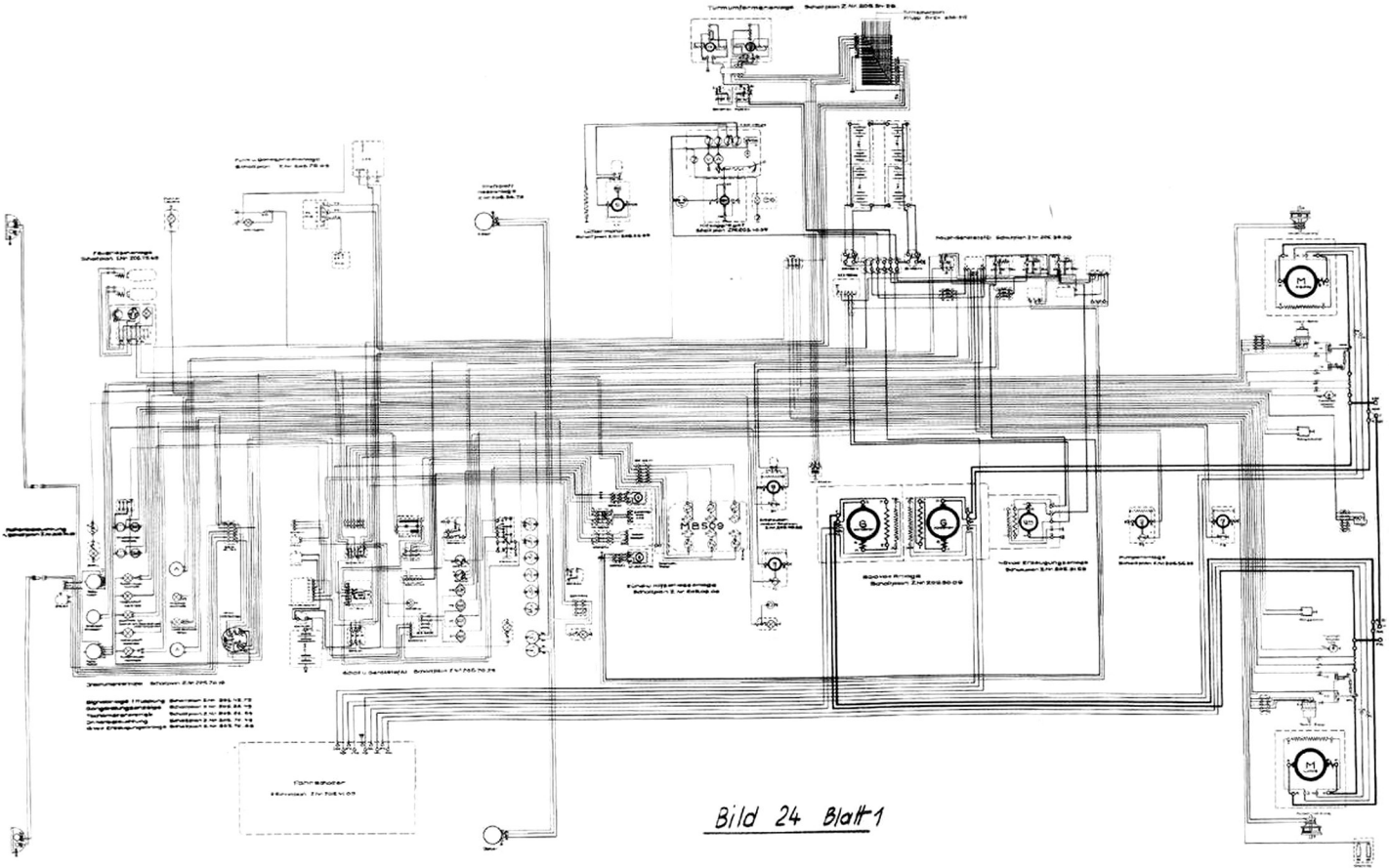
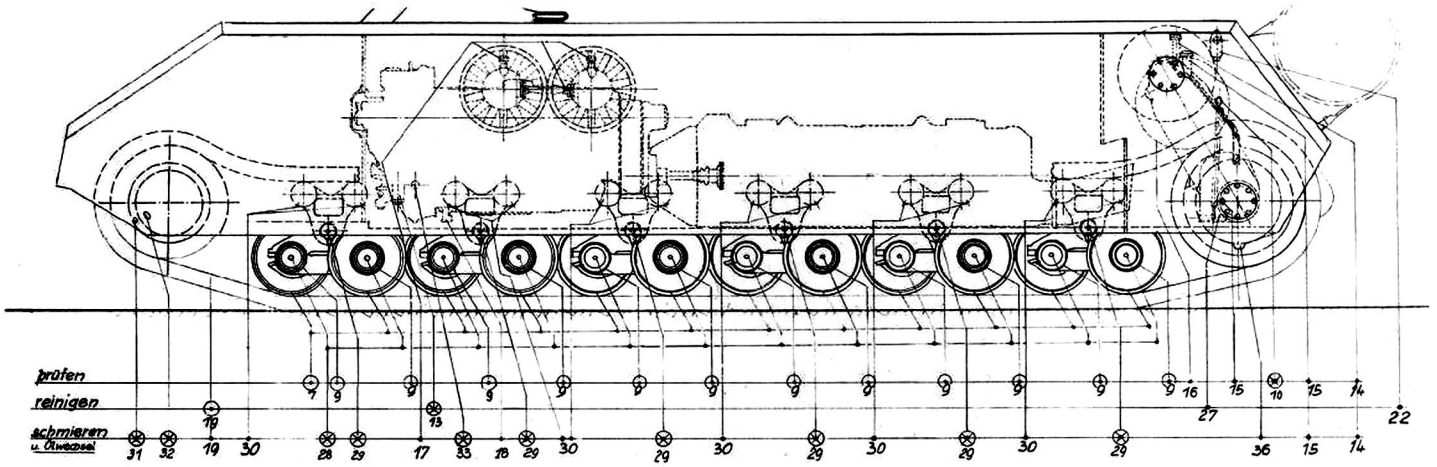
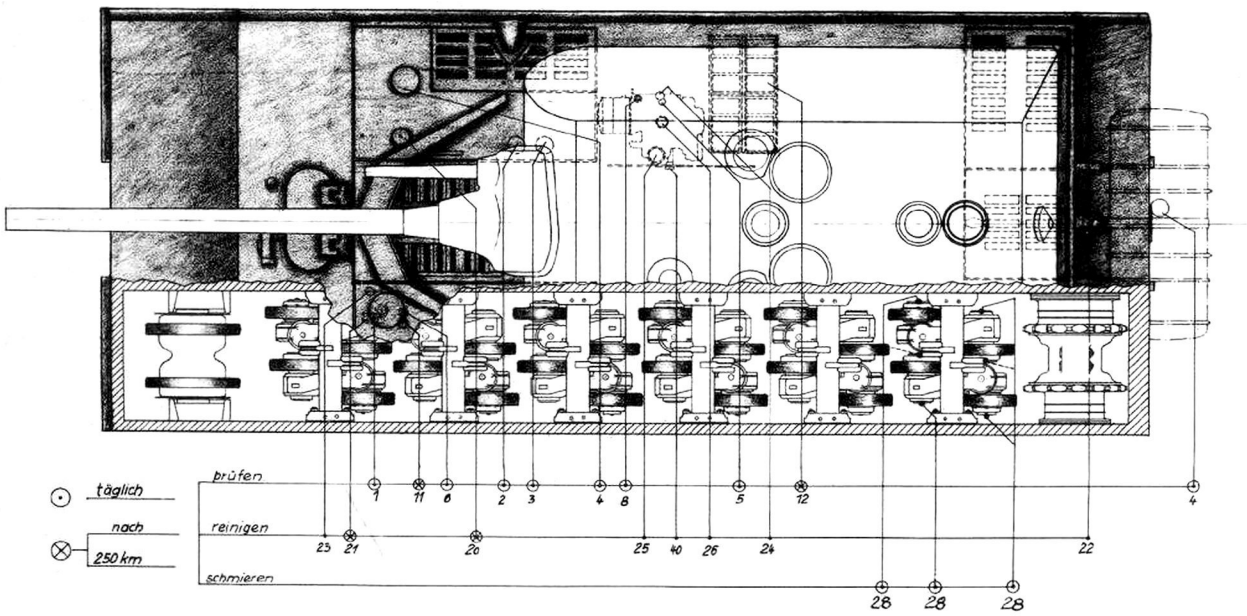


Bild 24 Blatt 1


prüfen
reinigen
schmieren
u. Ölwechsel


täglich
nach
250 km
prüfen
reinigen
schmieren

Maus Turret Equipment and Operating Instructions

Illustration 2 Turret with Gun at Maximum Elevation

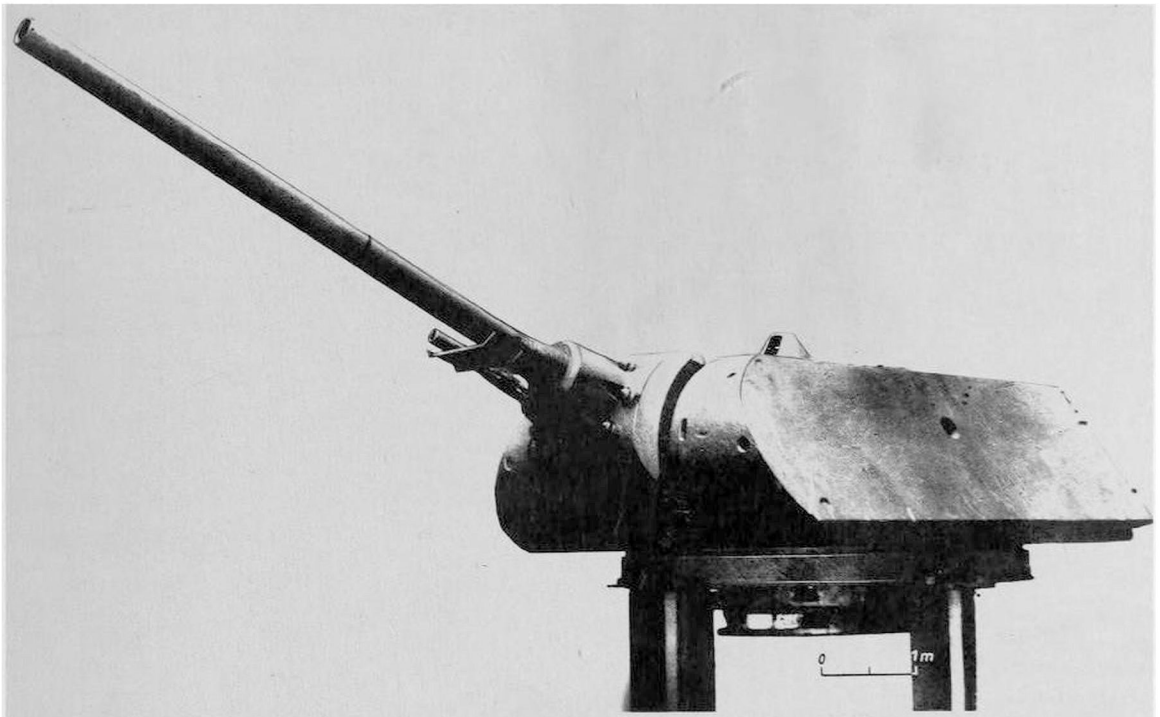


Bild 2. Turm, Rohre in größter Erhöhung

Contents

1. Brief description of the turret

2. Turret shell

3. Turret ??
   a) Traverse ring
   b) Raising system
   c) Guide rollers
   d) Turret lashing
   e) Revolving platform

4. Trunnion mounts

5. Cradle lock

6. Mantlet

7. Machine gun mount
   IV. Turret lighting

8. Machine gun trigger
   V. Emergency signaling system including

9. Periscope mount safety lamp

10. Turret telescopic sight mount
    B. Description of machinery and equipment

11. Turret telescopic sight

12. Rangefinder mount

13. Elevation gear

14. Turret traverse gear

15. Twelve o'clock indicator drive

16. Turret hatch cover

17. Ammunition hatch with SMG plug

18. Submachine gun ball mount

19. Close-defense weapon

20. Built-in ventilator

21. Ammunition racks
    a) 128mm ammunition
    b) 75mm ammunition

22. Accessory stowage

23. Bore evacuator compressor

24. Electrical equipment

A. General

I. Turret traverse
II. Compressor drive
III. Built-in ventilator
IV. Turret Lighting
V. Emergency signaling system with safety lamp

B. Description of machinery and equipment

I. Ward-Leonard drive
II. Traverse motor
III. Built-in ventilator
IV. Compressor motor
V. Traverse regulator
VI. 48-Volt plug connector box
VII. Low-voltage box Pz Nr. 5a

Preliminary Remarks

The following regulations form part of this description:

D: Chassis Equipment Description and Operating Instructions
D: The 12.8 cm KwK (128 mm Gun)
HDv: Ballistic Table for the 12.8 cm KwK
HDv: Data Sheet for Ammunition for the 12.8 cm KwK
D: Ammunition Manual for the 12.8 cm KwK
HDv: Data Sheet for Ammunition for the 7.5 cm KwK (75 mm gun)
D: Ammunition Manual for the 7.5 cm KwK
D: The MG 34
D: Loading Plan for the Pz Kpfw Maus
D: 635/5 Motor Vehicles in Winter
D: Radio and Intercom Equipment in the Pz Kpfw Maus

Brief Description of the Turret

Illustrations 1–14

The turret of the Maus armored fighting vehicle is equipped with a 128 mm KwK (D), a 75 mm KwK (D), and an MG 34.
The barrels are mounted side by side in a twin cradle suspended in trunnion mounts at its center of gravity. The barrel cradle is moved on its sector gear by an elevation drive with manual mode. The vertical aiming field extends from -7 to +23° (408). The opening for passage of the barrels through the front wall is shielded by a mantlet. The MG 34 is suspended in a frame to the left of the barrel cradle; it follows the barrel cradle's vertical movements by means of a gear drive. The turret's bearer ring sits in the vehicle's traverse ring. It rotates on three pairs of carrier rollers and is centered by six pairs of guide rollers. A raising system connected to the carrier rollers allows the turret to be lowered several millimeters, making it watertight from below. The turret traverse mechanism is powered electrically or manually. Lateral travel is unlimited. The tank driver uses a revolving periscope for observation of the terrain. Two direction indicator drives with a twelve o'clock indicator system show the position of the turret relative to the direction of travel. The telescopic sight is fixed to the left trunnion mount; its periscope is moved by a rhomboid linkage from the trunnion. Removal and installation of the aiming mechanism is simplified by an apparatus. The optical equipment is completed by a vertical range finder. When the vehicle is moving, a cradle lock takes the load off the elevation mechanism. Three turret locks prevent the turret from moving relative to the vehicle when it is under way. If the turret is lifted from outside when the locks are not engaged, integral compression links absorb some of the resulting forces. The rotating platform is a platform for the crew with hatches and openings through which ammunition stored in the vehicle can be moved to the turret. The turret crew is provided with seat straps, plus a larger seat cushion. Ammunition storage accommodates 24 128 mm rounds and 75 mm rounds. Next

to the MG 34 are four ammunition boxes each holding 250 rounds.
In the turret roof are two built-in fans for extracting the air, a revolving close defense weapon, an opening for the telescopic sight, a revolving periscope for observing terrain, and a vertical range finder. Four plugs can be replaced with lifting lugs.
The rear wall has an ammunition loading hatch with a lockable opening for firing a submachine gun. In each sidewall there is a large submachine gun ball mount.
Items of equipment for the crew and turret accessories are housed in racks or boxes inside the turret.
All turret openings and seams can be sealed watertight with simple hand grips. A special shaft is envisaged for deeper dives flange-mounted to an open turret roof hatch.
The main turret groupings referred to above, including the electrical system, are described in greater detail in the following section. Directions for servicing and cleaning the tank are included in the second part of the description.

Turret Shell

Illustration 5

The turret shell is made of welded plates. The side walls are sloped 30° from the vertical and the rear wall 15°. The face of the turret is convex, with a rectangular cutout for the barrel cradle; it also includes a machine gun embrasure.
The turret roof has cutouts for two entry hatches, two built-in fans, a revolving periscope, a telescopic sight, a vertical range finder, and a close defense weapon; there are also four openings with plugs for screwing in lifting lugs.
Each side wall has a ball mount for a submachine gun. In the rear wall there is a hatch for loading ammunition with a plug in the hatch for a submachine gun.
Welded to the turret base plate is the bearer ring with which the turret sits in the vehicle hull on rollers.

Turret Mounting

A) Traverse Ring

Illustration 5

The traverse ring supports the turret; it rests securely in the vehicle's armored hull, and adapters prevent lifting and a rod prevents turning. On its upper edge there is a rubber ring onto which the turret can be lowered, making the turret gap watertight from below.
The turret traverse mechanism's pinion engages the gearing and pinion the two twelve o'clock indicator drives.
The raising system rollers ride on the horizontal surface of the turret traverse ring; the guide rings ride on the vertical surface.

b) Raising system

Illustration 15

The turret rests in the traverse ring in the armored hull on three pairs of carrier rollers; on these rollers the turret can be manually lowered or raised by 6 mm [0.24 in.]. A bearing is attached at three places on the turret bearing ring. The roller mount, with two rollers, is mounted on the shaft. The worm can be turned with the ratchet lever, causing the worm gear segment to move the eccentric shaft and the bearing with turret to be raised or lowered.

Guide Rollers

Illustration 16

The turret is guided laterally in the armored hull's traverse ring by six pairs of guide rollers. Mounts are bolted on in six places on the turret shell's bearer ring. Each has a fork with a key to prevent turning. The roller mount with two rollers is mounted in the fork by a bolt. By turning the nuts, the rollers can be positioned in the traverse ring so the turret rotates centrically. To protect the rollers when the tank is hit from the

side, a guard is fitted that is weaker than the roller mount. The section of tube that serves as guard is jammed between bolts and plugs. In the event of shocks to the turret from the side, the forks take the bolts with them and crush the guard. The plate spring is tensioned and afterward returns the rollers to place. By tightening the plugs, the guard remains usable until excessive deformation makes replacement necessary.

Turret Locks

Illustrations 17 and 5

When the tank is on the move three locks prevent the turret from lifting. The turret locks are attached to the turret shell's bearer ring. Tightening the drive nuts wedges the toggles under the vehicle's traverse ring. The turret is now resting on the traverse ring's conical surface and can neither rotate nor rise.

Another effective safety is if the turret is lifted by external forces when in combat position. Beneath the traverse ring (illustration 5) on the turret bearer ring there are six ring pieces to which the tubular guards are attached. These guards are crushed if the turret lifts.

e) Revolving Platform

Illustration 18

The revolving platform is a platform for the crew and is suspended from the turret shell's bearer ring. The vehicle hull is accessible via a split hatch and two ammunition hatches. A second hatch is provided for monitoring the generator. A slip ring body projects through the cutout in the center to receive electric current. The platform's electric cable is attached to the slip ring body cover. To prevent the cable from being stretched when the turret rotates the cover is turned by a special cog.

4. Trunnion Mounts

Illustration 5

The two trunnion mounts support the barrel cradle; they are bolted to the turret base plate with a bracket. On the left trunnion mount there is a support mount for the aiming mechanism and its removal system. Also attached to this trunnion mount is the elevation mechanism.

5. Cradle Lock

Illustration 5

To protect the elevation mechanism against jolts when the tank is on the move, the cradle can be locked in the 0 (neutral) position or at an elevation of 23 degrees. A bolt on the cradle and one on the turret shell on each side are connected by a clamp attached by wing nuts.

6. Mantlet

Illustration 19

The opening for the barrels in the face of the turret is shielded by a mantlet; it is attached to the barrel cradle by pointed-head bolts. To prevent the mantlet from chafing against the front of the turret when the guns are elevated, they are kept at a distance by two pressure springs. When the mantlet is hit these pressure springs yield so the mantlet braces itself against the face of the turret. The mantlet can be made watertight by tightening the pointed-head bolts, pressing the mantlet and its sealing ring against the face of the turret. If it is in the way when the turret moves, the spring-mounted mast antenna on the vehicle is temporarily knocked down by the antenna deflector on the mantlet.

7. MG Mount

Illustration 20

The MG 34 is hung in a framework to the left of the barrel cradle. The frame rests in the turret face embrasure in a sealing ring and is bolted to the turret roof at the top.

The machine gun is supported by a mounting bracket attached to the framework by two trunnion mounts. The bracket, which also

serves as a shrapnel shield, follows the main gun in elevation; its gear segment is connected to a gear segment on the main gun by way of a pinion. The bracket sleeve fits into a slot in the frame on the sides.

The machine gun is inserted into the weapon mount and fixed to it with a sprung tensioning lever; a clamping jaw fits from below between corresponding lugs on the machine gun. At the rear, the machine gun is also supported by two lifting lugs. The support arm sitting in the weapon mount carries a support bearing on whose bearing pin sits a fork. This is guided by a locking pin and is kept in contact with the machine gun by a spring. The fork can be pulled back by a grip and swung down and to the right. A wooden box with harness beneath the machine gun mount serves as a spent casing collector.

The weapon mount is fed into the housing and a sliding key prevents it from turning. The spring, which is held by a lock nut, absorbs the recoil. At the front, the housing and its bearing block are clamped into the bracket; in the rear it is supported by way of an adjusting device on the arm of the bracket. After the bracket's clamping screw and the two clamp screws on the adjusting device are loosened the machine gun's elevation and angle can be precisely set by turning the two capstan nuts.

Adjusting the weapon mounting can only be undertaken by armory personnel. See D in "The Description of the MG 34."

8. Firing the Machine gun

Illustration 21

The machine gun is fired with the foot. By stepping on the footrest, the Bowden cable pulls a finger that presses against the machine gun's trigger. After the foot is lifted tension springs return the finger and footrest to their original positions.

9. Periscope Mounting

Illustration 22

The tank commander has a rotating periscope in the turret roof for observing the terrain. The revolving bearing plate bears a prism mirror in which the surroundings are reflected below in a display surface. After the knurled screw is loosened the mirror can be retracted until its upper flange comes to rest on the roller; in this position the mirror can be rotated horizontally and its top end cleaned or the entire mirror replaced. The mirror is watertight if the two handle buttons are flipped out and pulled in the direction of the viewer; as a result, the cam pushes the bearing plate with its sealing ring up against the cover plate. The dead center position of the cam maintains this position.

10. Turret Telescopic Sight Mount

Illustration 23

The support attached to the left trunnion mount bears the repository in which the telescopic sight is suspended. The telescopic sight is secured in the repository by a knurled screw. The stud screw beneath the repository makes it possible to set the height precisely. Three more adjustment screws in the support make precise lateral adjustments possible, as well as raising or lowering the target line. After adjustment the repository is fixed by three hexagonal bolts. The turret telescopic sight is fixed and immobile; only its mirror is moved by a pair of rhomboid linkages from the trunnion mount. The telescopic sight, which projects from the turret roof, is protected by an armored cover. Removing and installing the telescopic sight is simplified by an integrated device. Two telescoped tubes surround a pressure spring whose force is equal to about half the weight of the telescopic sight. If the telescopic sight is removed from its repository and placed on the upper tube it can be let off by pressing the handle. The device is held by the handles in its upper and lower end positions.

11. Turret Telescopic Sight
Illustration 24

12. Rangefinder
Illustration 6

At left, next to the telescopic sight, a vertical rangefinder projects through the turret roof. In the turret roof a rotating ring on ball bearings bears a fork in which the range finder is mounted. In the rest position it is lashed to the sidewall by a sprung hinge. After the range finder is removed the opening in the turret roof can be closed watertight with an armor plate with rubber gasket. The armor plate is tightened from inside by a bracket with tension screw.

13. Elevation Gear
Illustration 25

The elevation gear is a sector gear leveler; it moves the barrel cradle and with its housing is attached to the left trunnion mount. One turn of the hand wheel changes barrel elevation by 1º or 17-. Turning the hand wheel is transmitted via two bevel gears to a worm shaft that engages the worm gear. The worm gear turns the pinion, which is connected to the barrel cradle's sector gear. Swinging of the gun barrel during travel does not overload the worm teeth, as the worm shaft can absorb shocks by yielding up or down. It does so by pressing the two plate springs together via the two lower ball bearings. Nevertheless, the barrel cradle must be locked while driving or during rail transport.

14. Turret Traverse Mechanism
Illustration 26

The turret is traversed by the turret traverse mechanism, which is attached to the turret bearer ring and electrically powered. Fine traverse adjustment is accomplished with the manual drive, which can be assisted by an auxiliary power unit if the engine is out.

Motor Drive: the electric motor drives the worm (4) by means of gear (1), and optionally (2) or (3); this turns the worm gear (5) and the bevel gear (6). The bevel gear pair (7) rolls off the resting bevel gear (8). As a result, the axle (9) takes along the shaft (10) and pinion (11), engaging the vehicle's traverse ring via an idler gear (12). If the motor does not pull enough on steeper slopes a slower gear can be selected. By pulling out and moving the shift button into its forward stop the claws can be separated from Gear 3, and Gears 2 and 3 meshed with the pinion shaft beneath it. Traverse speed in fast gear is 8 º/s, in slow gear 4 º/s.

Manual Drive: the bevel gears (13 and 14) both engage the third bevel gear (15); they drive the worm (16) via the worm gear (17) and the bevel gear (8). In the process, the bevel gear pair (7) now rolls off the stationary bevel gear (6); the pinion (11) is driven as when the motor is running. A friction clutch is fitted to protect the transmission from overloading. If the turret is forcibly turned from the outside then the pinion (11) slips empty from the clutch cones, which are stretched accordingly by plate springs. For information on the electric motor see chapter Electrical System. One turn of the hand wheel changes azimuth by 0.32º = 5.7-.

15. Twelve o'clock Indicator Drive
Illustration 27

Two twelve o'clock indicators show the tank commander and gunner the position of the turret relative to the direction of travel. The drives are mounted on the turret bearer ring. The pinion engages the vehicle's traverse ring. Rotation of the pinion is transmitted via a shaft to the twelve o'clock system and by means of a reduction gear translated so that one revolution of the turret equals one revolution of the indicator.

16. Turret Hatch Cover
Illustration 28

The hatch covers that cover both entry openings in the turret roof are raised for opening and swung out to the side. The hatch cover is guided by the mount bushing. The spring offsets most of the weight of the cover. By turning the spindle to the right the hatch cover is raised sufficiently from the gasket for it to be swung to the side by its handle.

17. Ammunition Hatch with Submachine gun Plug

Illustration 29

An ammunition loading hatch is located in the rear wall of the turret. The hatch is made watertight by tightening a nut. The plug, held by a chain with spring, can also be pushed outward; it frees the opening for firing the submachine gun.

18. Submachine gun Ball Mount

Illustration 30

There is a submachine gun opening in each side wall. The revolving ball mount is a ball insert held in place by a thrust collar. The submachine gun opening in the ball mount can be secured by a sealing bolt. The sealing flap is pushed outward by its handle and turned 180 degrees to the side to uncover the field of fire.

19. Close Defense Weapon

Illustration 31

Mounted in the turret roof is a swiveling close defense weapon. It is used to fire Schnellnebelkerzen 39 smoke candles, mortar shells, orange 160 smoke signals, and Leuchtgeschosse R flares. These are fired using firing pins and C 43 St threaded percussion primers. The swiveling launcher rests in a groove between the mounting ring and intermediate ring. The end cap is attached to the launcher by a hinge and is locked by the rotatable ring with grip in the launcher's bayonet catch. On the locking cap sits the firing pin mechanism for inserting the C 43 St threaded percussion primer and the trigger.

The locking cap has a stop-cam to prevent premature firing; it only releases the trigger when the bayonet catch is closed. The tensioned trigger can also be secured by a safety pin.

The launcher's elevation is fixed at about 50 degrees, and a clamping screw allows firing direction to be adjusted to either side.

An armor plate protects the launcher, a plug with sealing ring closes the firing opening, and a shaft seal closes the gap between the launcher and intermediate ring.

Mode of operation:

Pressing the trigger releases the firing pin and strikes the C 43 threaded percussion primer. When smoke candles and smoke signals are used, Throw Charge 1 (the propellant charge for mortar rounds and flares) is ignited, ejecting the loaded projectile (see appendix for operation and handling information).

20. Built-in Ventilators

Illustration 32

The two electrically powered ventilators in the turret roof are each protected by an armor plate. The air vents can be made watertight by means of a hood slid over the vent and secured with screws. Ventilator performance is 12 m^3/min [732,300 in^3/min].

21. Ammunition Storage

128mm Ammunition Illustration 33

A total of twenty-four rounds of 128 mm cartridge ammunition is stored in the two rear corners of the turret. The two ammunition racks are identical in design. Two web plates bolted to the floor of the turret are joined by nineteen welded storage tubes. Two shells are stored one behind the other in each of the five tubes on the sloped side wall and one in each of the two tubes under the turret

roof. The twelve tubes with the greater diameter each accommodate one cartridge case. The projectiles are stored as follows: the projectile inserted into a storage tube rests with its tip in a grommet. On the fixed threaded bolt sits a bottom cap that is adjustable longitudinally and can be swiveled up to the side. This cap is slid over the base of the projectile and tightened with a wing nut. The second projectile is immobilized the same way. When removing the projectiles, after the bottom cap is swiveled out of the way, the second projectile is immediately available; the first projectile, which is further in, is taken out by pulling the push rod. The cartridge cases are stored in a similar way, except instead of a bottom cap a finger is pressed against the casing bottom.

75 mm Ammunition
Illustration 34

22. Accessory Storage
Illustration 35

23. Barrel Blow-out Compressor System
Illustration 36

After firing, the 128 mm barrel is blown out when the breech is opened. The compressed air is produced by a compressor mounted on the turret platform. The electric motor drives the compressor by way of a V-belt. The automatic clutch in the flywheel only engages when the motor has reached the necessary speed, then the compressor takes in air through an air filter, forces it into the air vessel, and from there through an armored hose and conduit to the cannon breech. If the pressure in the air vessel has reached a level set on the regulator valve, the valve opens. The exiting air regulates the compressor intake opening through a valve piston so it empties.

24. Electrical System less communications equipment
A. General

The following voltages are available for the electrical system:

+/- 330 Volts variable voltage for: turret traverse mechanism

48 Volts constant voltage (vehicle battery) for: Ward-Leonard drive motor, operation of traverse motor, and supplying the compressor motor and contactor.

12 Volt constant voltage for: Radio equipment, interior lighting, firing gun, emergency signaling system, and safety lamp ventilator.

The electrical system includes:

I. Turret traverse mechanism
II. Compressor drive
III. Built-in Ventilators
IV. Turret lighting
V. Emergency signaling system, including safety lamp.

I. Turret Traverse Mechanism
Illustrations 38 and 39

The main drive of the turret traverse mechanism is electric. Illustration 38 shows the special Leonard switch used here. In the lower turret traverse range, voltage is fed into a branch resistor in the generator field always with a counter-flow of half the armature voltage (picture 39, illustration 1). In the upper traverse range the branch circuit passes over into the open switch. Here the generator field is laid over a series resistor—which can be switched off—at a constant 48 Volts (picture 39, illustration 2). Picture 39, illustration 3 shows the velocity regulation over the entire traverse range. In the lower traverse range velocity increases slowly, making it possible to place the barrel precisely in the target line. The turret can track a fast-changing target in the upper traverse range; accordingly, the last part of the velocity line shows a sharp rise. Traversing the turret at different speeds happens through a

different layout of the traverse regulator. It has leak resistance from lamella 1-15 for the lower traverse range (branch circuit) and series resistors for the upper traverse range 16-33 (open circuit). All resistors lie in the excitation circuit of the Ward-Leonard generator and are switched on or off depending on the selected speed. The individual resistance levels are connected to a collector from which the controlled voltage is tapped for the branch circuit and the open circuit. The gradation of the regulator resistance is the same from the zero position to both sides of the collector (picture 39, illustration 4). The polarity is such that the turret's direction of traverse follows the regulator delivery direction. In the regulator in the zero position a self-killing effect is created within the Ward-Leonard generator's excitation circuit that immediately stops the turret. This effect is achieved as follows (picture 39, illustration 5): if the excitation voltage is taken away from an externally excited Ward-Leonard generator, a remnant generator field still remains in the original direction and produces a residual voltage in the surrounding generator armature, causing the motor to rotate slowly. In the traverse regulator's zero position, the generator field is switched against the half residual armature voltage; a current flows through the generator field in the opposite direction of the original exciting current. This destroys the present residual magnetism and then another drop in the residual armature voltage takes place. The power generator for the turret traverse mechanism is in the vehicle. It consists of the DC drive motor and the Ward-Leonard generator coupled to it. The machine unit has the following specs:

Power 13 kW, voltage 48 Volts, speed 3,500 rpm, field voltage 48 Volts

The DC shunt motor has the following specs: traverse motor: power 7.5 kW, short-term voltage +/- 330 Volts, field voltage 48 Volts, speed 3,000 rpm.

The Ward-Leonard generator's motor is powered by the vehicle's 48 volt battery. When the switch (10) in the turret is activated, the electric contactor steps in and connects the motor to the vehicle's battery. To ensure it is safe to enter the turret, there is an emergency switch by the entry hatch that can be activated by a short tap and immediately stops the turret. The emergency switch causes the same effect as when the traverse regulator is placed in the zero position (self-killing). All of the motors are to P 33 protection standard and are ultra-shortwave suppressed; they have tropic-proof insulation and roller bearings with special clearance. (These are bearings with very small tolerances between race and balls or rollers. This avoids the formation of "chatter marks" on the running surfaces that arise with stationary bearings and heavy vehicle vibration.)

II. Bore Evacuator System Compressor Drive

A DC motor producing 1,000 Watts at 6,000 rpm and 48 Volts powers the compressor (Himmelwerke A.G. Tübingen). The motor is connected in the 48 Volt plug connection box (4) and can be switched on and off at the switch (11).

III. Built-In Ventilators

There are two built-in ventilators in the turret roof (S 12, 180 Dm. Motor Horn Type GH 2/40 by König Friedrich-Alfred-Hütte, Freital-Dresden). Switching is undertaken in such a way—via a toggle switch (9) or changeover switch with zero position—that only one ventilator can run at a time. The ventilators are powered by series motors connected to and also fused by the Pz. Nr. 5 c 12 Volt terminal box (5).

IV. Turret Lighting

There are three 5-Watt lights inside the turret that are connected to and also fused by the Pz. Nr. 5 c 12-Volt terminal box (5). The

lighting is unipolar wired. The lights are dimmable; they shut off automatically when fully dimmed. Apart from the lights, plugs are also available for optics lighting and for the hand lamps.

V. Emergency Signaling System including Safety Lamps

In the event of failure of the intercom between the turret and vehicle, an emergency signaling system can be used as a replacement communications system. The emergency signaling system essentially consists of Teller horns in the turret and in the vehicle, each with an interconnected signal lamp. The emergency signaling system is powered by the 12 Volt vehicle battery and can be activated either by a changeover switch (25) in the turret or in the vehicle. This system allows messages to be passed between the turret and vehicle. The safety lamp (24) is in the tank commander's field of vision and enables him to determine whether the driver is driving with the track drive electric motors in over-current, over-speed, or over-temperature. This allows the tank commander to decide whether or not to proceed in case of danger.

B. Description of the Motors and Equipment

Described are:

I. Ward-Leonard machine unit
II. Traverse motor
III. Built-in ventilator
IV. Compressor motor
V. Traverse regulator
VI. 48-Volt plug connection box
VII. Pz Nr. 5 c V low-voltage box

V. Traverse Regulator

Illustration 40

The traverse regulator controls the excitation flow from the Ward-Leonard generator; this changes the current fed to the traverse motor and thus its revolutions. The traverse regulator also carries out the bridging contact and reversion of polarity of the excitation circuit necessary for the special Ward-Leonard circuitry. The drum is housed in the casing, consisting of the bottom part and cap. It carries the slip ring body with the slip rings and collector lamella, plus the coil carrier with fifteen branch resistors and one series resistor. The resistance levels are attached to the lamella (1-15 branch circuit for lower traverse range, 16-33 open circuit for upper traverse range). Two lamella equidistant from the switch cylinder zero point are connected (illustration 39, image 4). As a result, equal resistance levels are always engaged when the hand wheel is turned to the right or left. The contact deck for acceptance of the controlled voltage is set up for thirty-two resistance levels. When the switch cylinder is rotated, the brushes on the slip rings carry out the bridging contact and reversion of polarity of the excitation circuit necessary for the special Ward-Leonard circuitry; their supply lines are attached by the intentional suppression device on the plug. The traverse regulator housing is sealed electrically by a braid.

VI. 48-Volt Plug Connection Box

Illustration 41

In the plug connection box, the wires in the rubber tube lines from the slip ring transducer are distributed to the traverse regulator, traverse motor, and the compressor motor. The rubber tube line is introduced through the plug and socket; the plug pins are irregularly offset to avoid confusing circuits. Cable entries are provided for the connecting cables. Connected to the distributor terminal board are:

- the +/- 330 Volt Ward-Leonard voltage circuit on terminals 16 and 17
- the 48 Volt constant-voltage circuit on terminals 13, 14, 15, and 18

The 6-place fuse box contains the following

fuses:
- 15 Amp for excitation of the traverse motor and traverse regulator
- 40 Amp for the compressor motor.

The resistor serves as a protective resistor for the traverse motor field. The housing cap is watertight; it can be opened easily.

VII. Pz. Nr. 5 c Low Voltage Box

It serves to distribute the individual wires of the low-voltage cable coming from the slip ring transducer. The cable is introduced through the plug and socket. Inside the box is a terminal board for connecting the wires and a six-place fuse box with fuses for the individual power users. Connected are: firing mechanism, emergency signaling system, safety lamps, turret lighting, built-in ventilators, and the intercom.

Contents Handling and Operation

1. Electrical system
- **a)** Electric turret traverse mechanism initial operation
- **b)** Ongoing maintenance
- **c)** Rectifying faults

2. Turret sealing instructions

3. Care

4. Removal and installation of turret telescopic sight

5. Adjusting the turret telescopic sight

6. Close-defense weapon
- **a)** Loading
- **b)** Preparing to fire and what to do in event of misfires

1. Electrical System

a) Electric Turret Traverse Electrical System Initial Operation

Illustration 38

Turn switch device No. 10 to "ON." This switches the electric contactor for the Ward-Leonard drive motor in the vehicle to the 48 Volt vehicle battery. After switching on the Ward-Leonard machine unit, wait several seconds until the Ward-Leonard generator has reached its nominal speed, then traverse the turret by engaging the traverse regulator.

b) Ongoing Maintenance

Check the brushes on the generator's comutators and the motor. Clean the comutator and lightly grease with resin-free grease. Check the brushes in the traverse regulator for good contact.

The fuses for the 48 Volt circuits are found in plug connection box apparatus No. 4.

The fuses for the 12 Volt circuits are found in low-voltage box Pz. Nr. 5 c.

c) Rectifying Faults in the Electric Turret Traverse Mechanism

No.	Occurrence	Cause	Remedy
1	The electric traverse does not start	a) Emergency switch by the entry opening switched off b) Fuse burned out	Turn on emergency switch Replace fuses in plug connection box Pos. 4
2	Turret moves too slowly over entire control range	Speed of the Ward-Leonard drive motor too low	Check voltage on Ward-Leonard generator. Desired value 48 Volts. Check voltage on terminals 18 and 12 in traverse regulator. Desired value 48 Volts.

No.	Occurrence	Cause	Remedy
3	Turret continues to move slowly with traverse regulator in zero position.	Fault in self-kill circuit.	Check excitation circuit of Ward-Leonard generator. Repair circuit.
4	The turret only turns at two speeds (1 medium, 1 fast)	Break in the voltage divider and series resistor circuits or slip rings in traverse regulator	Repair break
5	Turret does not turn in part of the control range	Break in the voltage divider circuits	Repair break
6	The turret moves jerkily	Over-compounding	Adjust the brushes of the Ward-Leonard generator
7	The turret follow-up is too great, it does not immediately stop	No self-kill	Never exchange the A and B lines as electrical equipment is extremely threatened and the self-kill will engage brake. Therefore only the traverse motor's pipeline must be replaced.

2. Instructions for Waterproofing Turret

1) Pull back machine gun, seal embrasure with plug.
2) Place watertight cap on the barrel.
3) Release turret locks, raise barrel if necessary, and pivot backward toward the center.
4) Lower turret on the raising system's three ratchets onto the traverse ring. Tighten turret locks.
5) Seal the mantlet by tightening the designated pointed-head bolts.
6) Slide hoods over built-in ventilators and tighten.
7) Close all machine gun stops.
8) Insert close defense weapon plugs and close sealing cap.
9) Remove telescopic sight and seal lid with cover.
10) Press the revolving periscope firmly.
11) Replace the range finder with designated cover cap.
12) Close the turret hatch cover.

3. Care and Lubrication of the Turret

1) Tighten cradle and turret locks when the vehicle is on the move and during rail transport.
2) Do not use the elevation gear if the cradle is locked or the mantlet is waterproofed. Determine if these parts have been released before using the elevation gear.
3) Do not operate the traversing gear if the turret has been lowered for waterproofing or is locked.
4) Handle the turret telescopic sight and revolving periscope with care. Only allow an armorer to align the telescopic sight.
5) Protect all rubber seals against oil and check and keep clean.
6) Do not damage interior equipment while climbing in or out through the hatch. Handle the individual groups as follows:

Traverse Ring: grease teeth on the traverse gear pinion.

Raising system: grease worm.
Guide Rollers: after hits on turret, feel to see if safeties are still correctly tensioned; if not, tighten or replace safeties.
Turret Lock: grease the threads and contact area of the impact nut.
Mantlet: check the sealing ring for damage at intervals.
Machine gun Mount: grease sliding surfaces of weapon mount in housing.
Turret Telescopic Sight Mount: keep linkage, mount, and screws free of rust.
Turret Telescopic Sight:

Revolving Periscope:
Elevating Gear: check oil level in the casing. Grease the pinion gear and gear segment in the cradle. Turn off the motor to shift and shift as motor is running down.
Turret Hatch Cover: Grease mount.
Ammunition Loading Hatch: maintain seal in undamaged condition.

4. Removal and Installation of Turret Telescopic Sight

Illustration 23

1) Release rhomboid bars by pressing the grip on the telescopic sight lever.
2) Loosen knurled screw
3) Remove the telescopic sight from its mount and place on the removal device. Do not turn any of the mount adjusting screws!
4) Hold the telescopic sight. Let down the telescopic sight by pressing the catch on the removal device until the catch clicks into place and holds the removal device in its lower position. Remove the telescope. Install in analogous order.

5. Adjusting Turret Telescopic Sight

Illustration [no information in the original—author]

6. Close-Defense Weapon

Operating Instructions

Illustration 31a

a) Loading

Open the breech cap by turning the bayonet lock to the right. Remove the breech plug, place propellant charge in the launcher, and close the breech cap again. Pull back the firing pin against pressure of the hammer spring until it engages. Pull the firing pin back slightly while inserting the C 43 St threaded percussion primer into the cutaway. To fire, release the trigger safety and push upward.

b) Preparing to Fire and Action in Event of Failure

Preparing the Schnellnebelkerze 39 smoke candle: After removing the protective cap, insert N 4 priming charge (green-painted part first). Then gently screw propellant charge 1 into the primer threads of the Schnellnebelkerze 39. Do not over-tighten, as the threaded nipple is plastic and will break off if tightened. Insert the complete smoke candle with propellant charge downward into the launcher. Close the breech cap. Fire using the trigger.

Safety Regulations

The kit in the middle of Propellant Charge 1 and in its threaded nipple is friction sensitive. It is therefore forbidden to scratch it with a fingernail or tool. Do not use candles with attached propellant charge that cannot be inserted easily into the launcher. Forcing them in is forbidden. Handle the weapon with utmost care after placing the propellant charge. For safety precautions against artificial smoke see H.Dv. 201/1 No. 34 and H.Dv. 211/5 No. 15.

Misfires

If the smoke candle does not ignite when fired, tension the firing pin and fire again. If there is another misfire, insert a new C 43 St threaded percussion primer and fire again. If there is another misfire and the threaded percussion primer is properly

placed then the propellant charge is faulty. Replace the charge with a new one. During training, candles that fail to produce smoke are to be disposed of by burying (about 50 cm [19.7 in.] deep). Any other method of destruction is forbidden. Keep the close defense weapon launcher clean at all times.

Preparing the orange 160 smoke signal:

Remove tape from the box. Place Propellant Charge 1 with smoke signal together in the designated cardboard cover and insert into the launcher. Close the launcher and fire with the trigger.

Misfires:

Source of failure is similar to smoke candles. Bury smoke signals that fail like smoke candles.

Preparing the Flare Cartridges:
Text follows later.

Preparing Sprenggranatpatrone 326 Lp grenade:

Whenever possible, fire the Lp through the close defense weapon opening, as this provides the best splinter protection. Only fire the Sprenggranatpatrone 326 Lp with the Lp and load as normal ammunition. Grenade range is about 7-10 meters [23-33 ft.]. Detonation point is 0.5-2 meters [1.64-6.56 ft.] above the ground, as delayed-action fuse burn time is about one second. Only fire the Spgr. Patr. 326 Lp from armored vehicles or appropriate cover. Fragment range is 100 meters [328 ft.] in all directions, therefore keep all turret hatches and openings closed when firing.

Safety Precautions

Grenades that do not separate and are still hanging on the wire can be carefully reloaded. Do not pull on the wire to prevent activation of the pull-wire fuse. Throw unloaded grenades from the tank and treat them as duds.

List of Illustrations

1 Turret, view from left

2 Turret, barrel at maximum elevation

3 Turret, view from top left

4 Turret, view from left front

5 Turret, cross-section, view from left

6 Fighting compartment, left side

7 Fighting compartment, turret traverse drive

8 Fighting compartment, turret traverse drive, and elevating gear

9 Fighting compartment, from below

10 Raising system, guide rollers, and turret lock

11 128mm ammunition storage

12 Machine gun mount

13 Fighting compartment, right side

14 Turret roof

15 Raising system

16 Guide rollers

17 Turret lock

18 Rotating platform

19 Mantlet

20 Machine gun mount

21 Machine gun firing

22 Rotating periscope mount

23 Turret telescopic sight mount

24 Telescopic sight

25 Elevating gear

26 Turret traverse drive

27 Twelve o'clock indicator drive

28 Turret hatch, right

29 Ammunition loading hatch

30 Machine gun ball mount

31 Close-defense weapon

32 Built-in ventilator

33 128mm ammunition storage

34 75mm ammunition storage

35 Accessory storage

36 Barrel bore evacuator compressor

37 Target table

38 Pz Kpfw Maus circuit diagram

39 Turret traverse schematic

40 Traverse regulator

41 48-Volt connection box

Illustration 1: Turret, view from left.

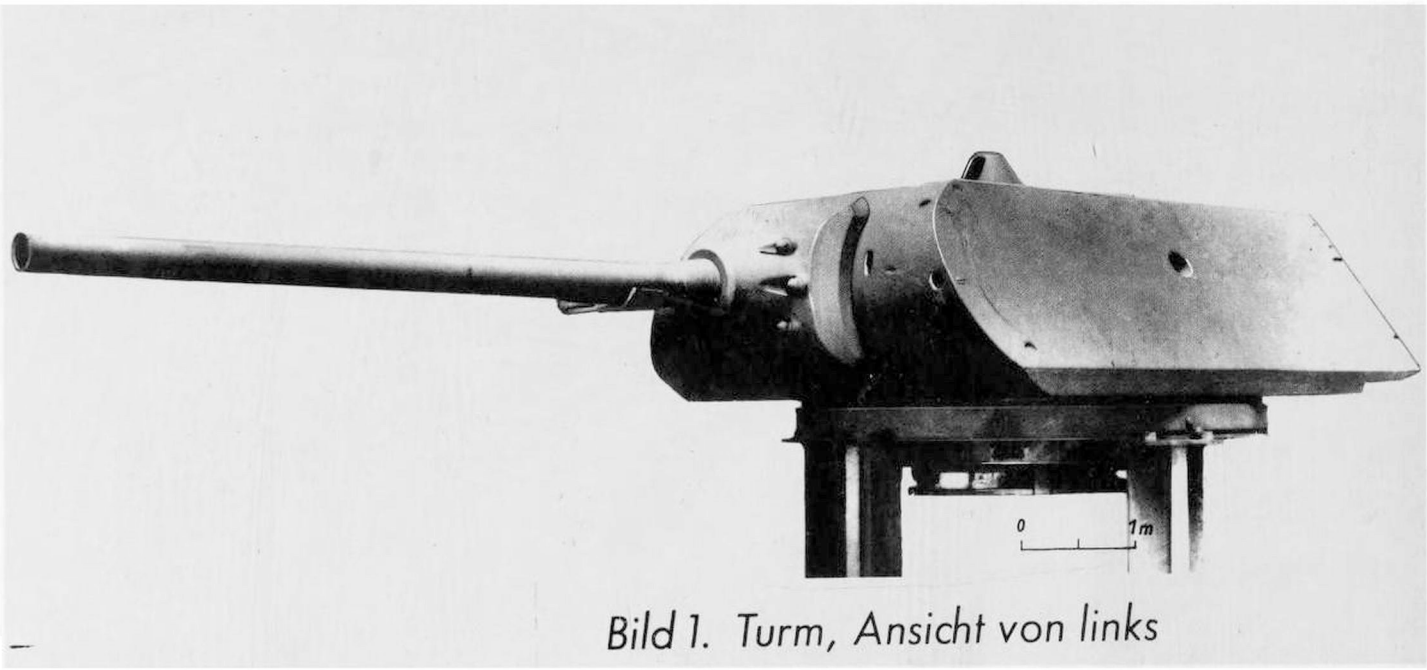


Bild 1. Turm, Ansicht von links

Illustration 5

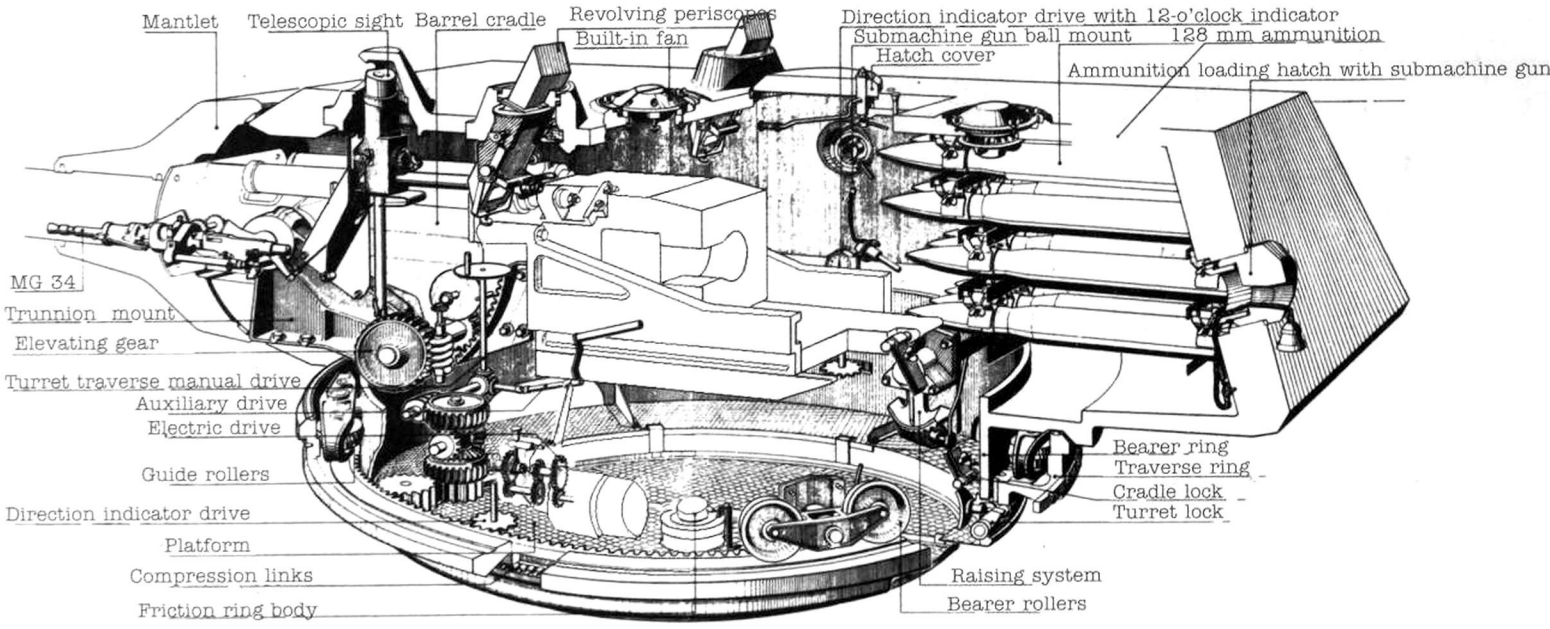
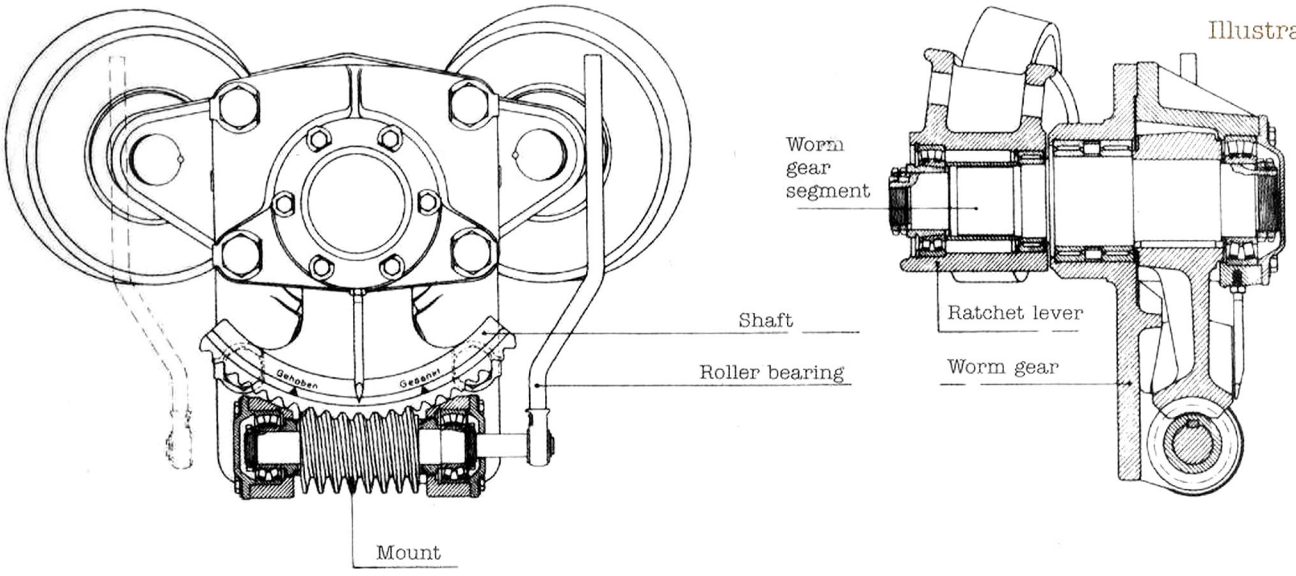


Illustration 15



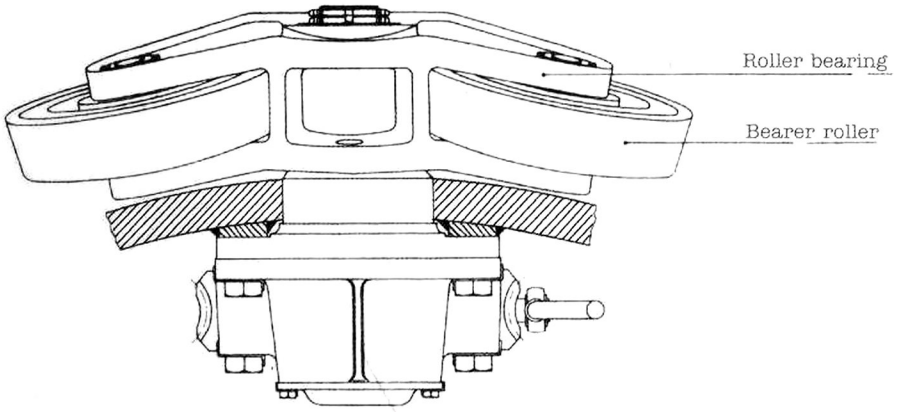


Illustration 18

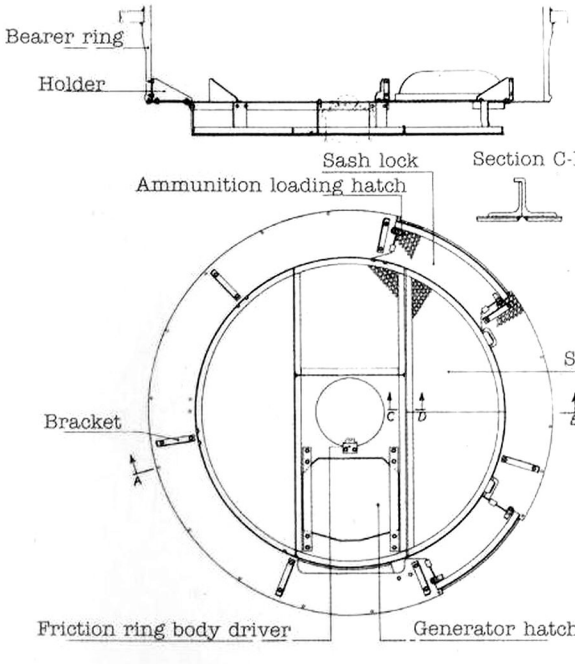
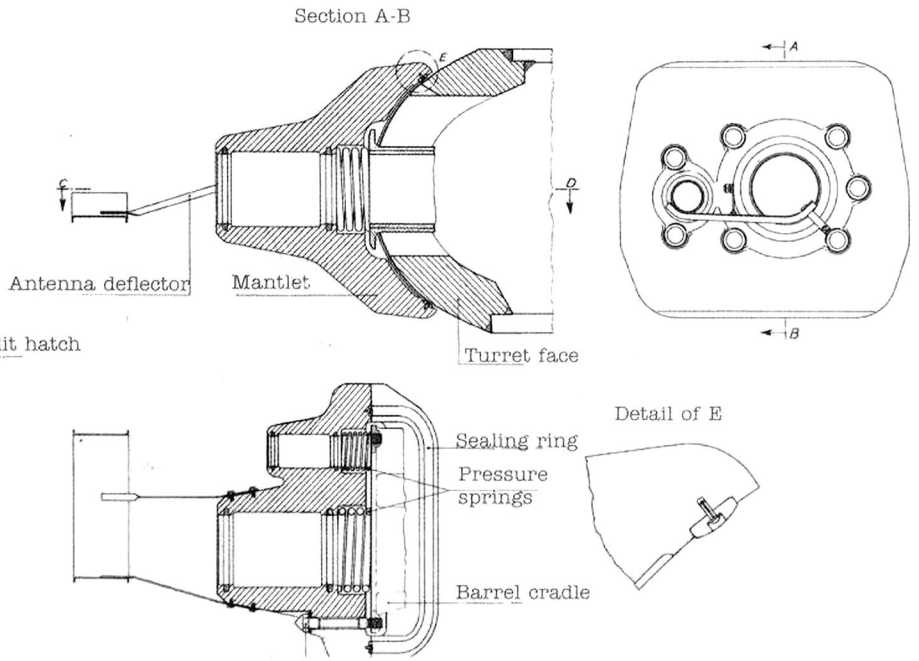
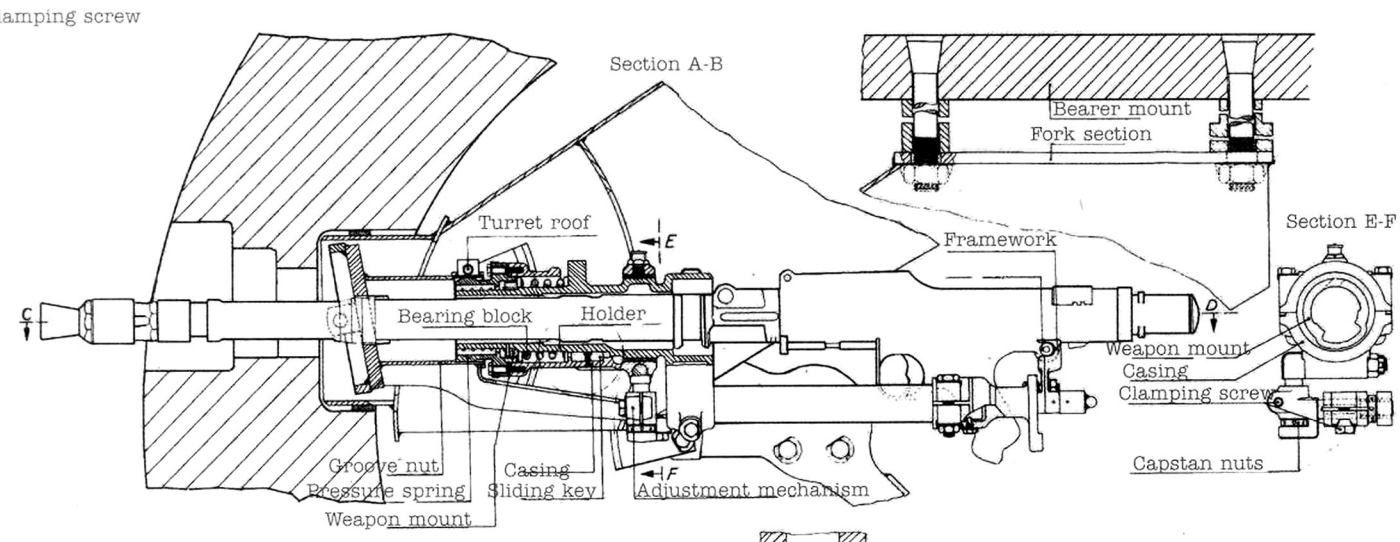


Illustration 19
Raising System





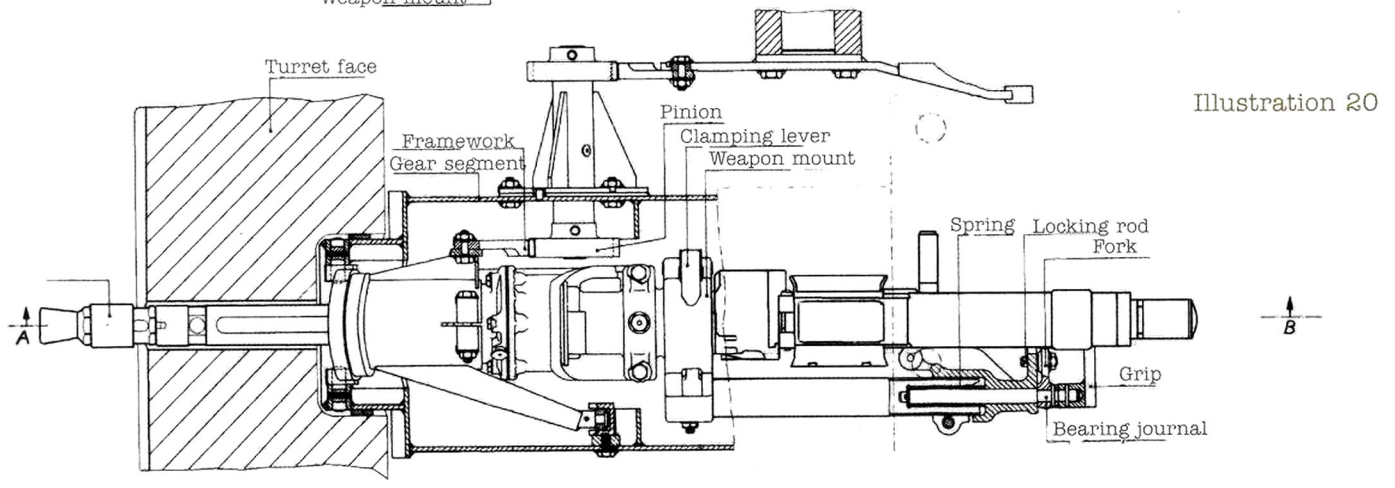


Illustration 20

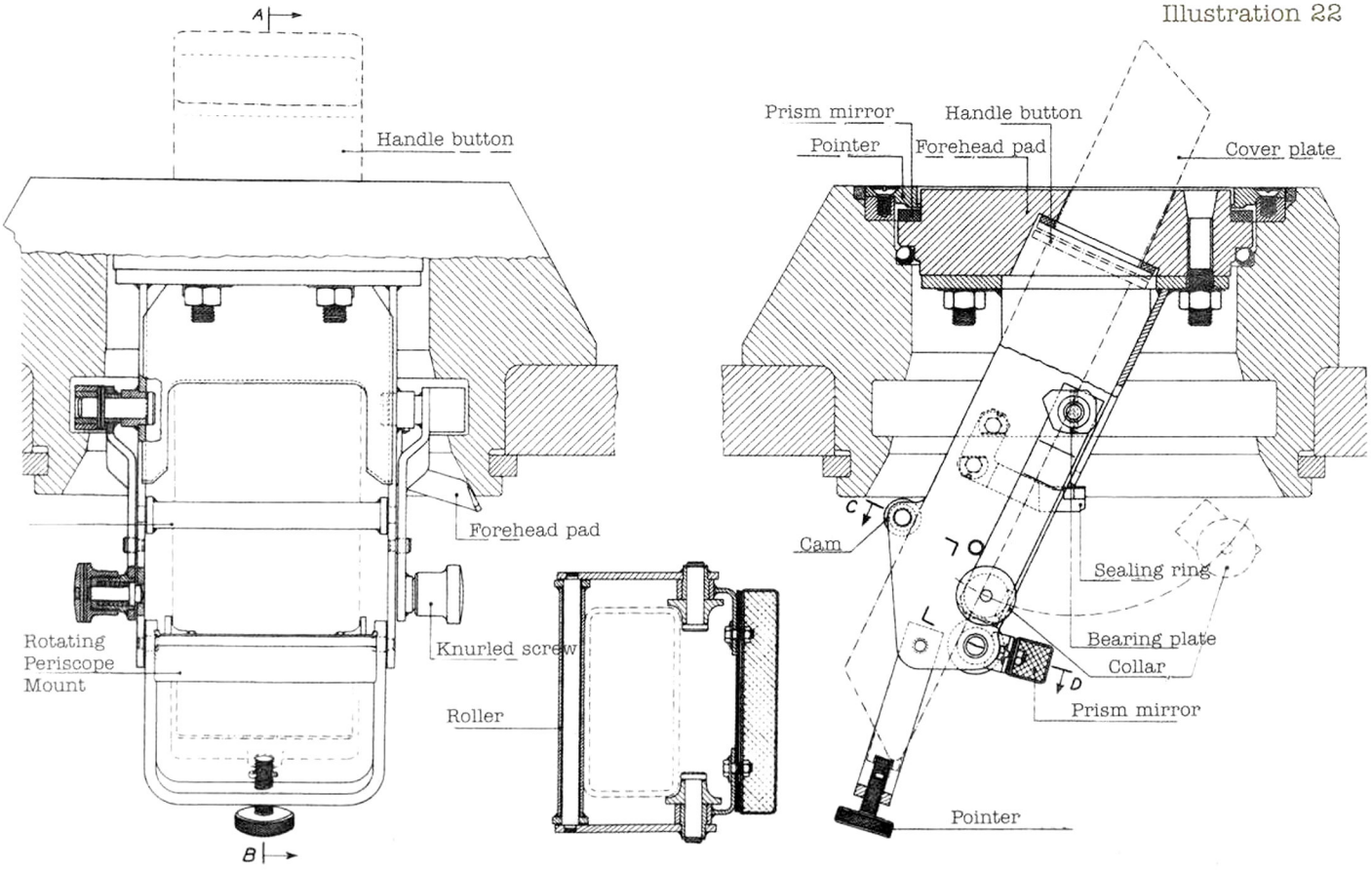
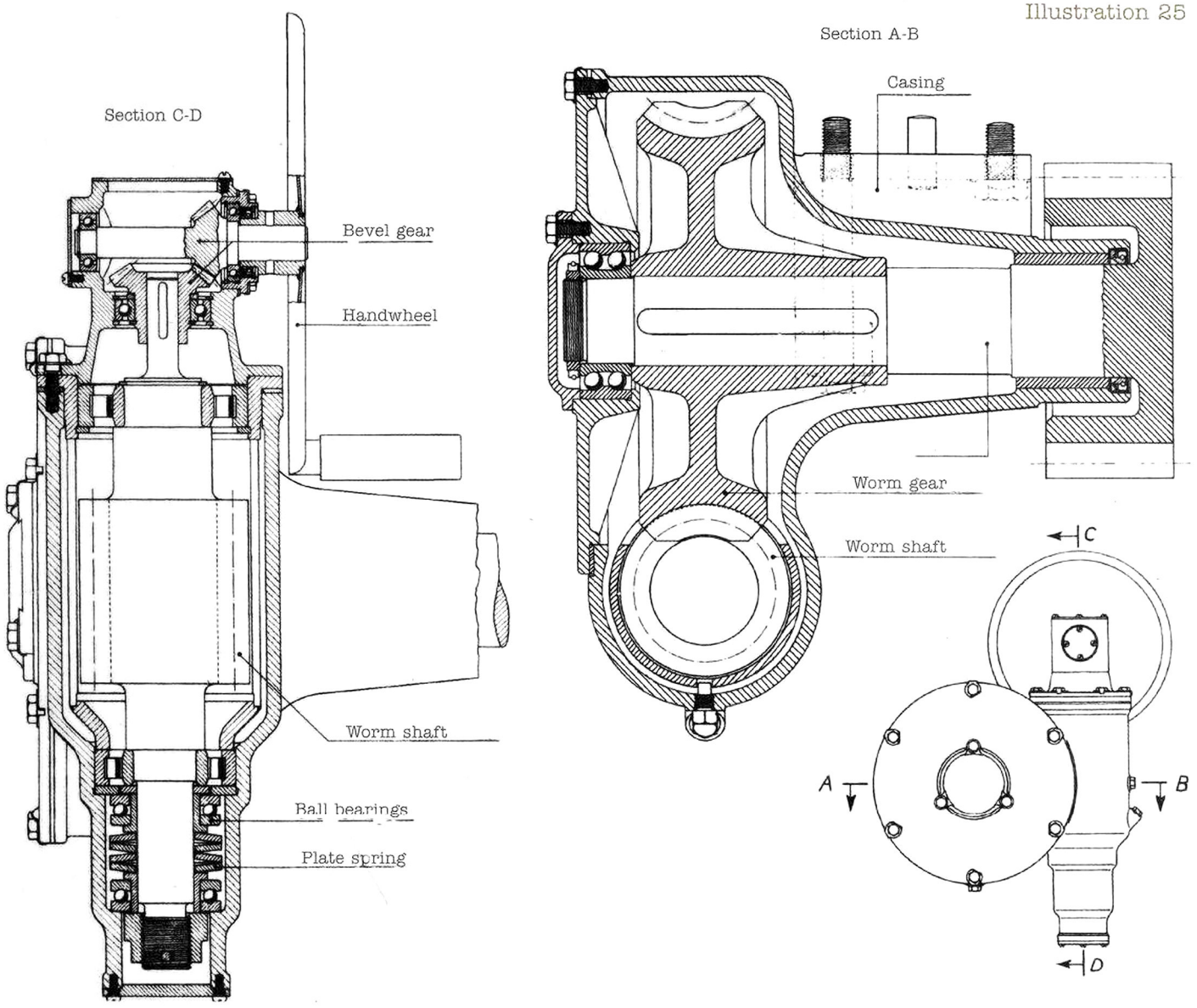


Illustration 22

Illustration 25



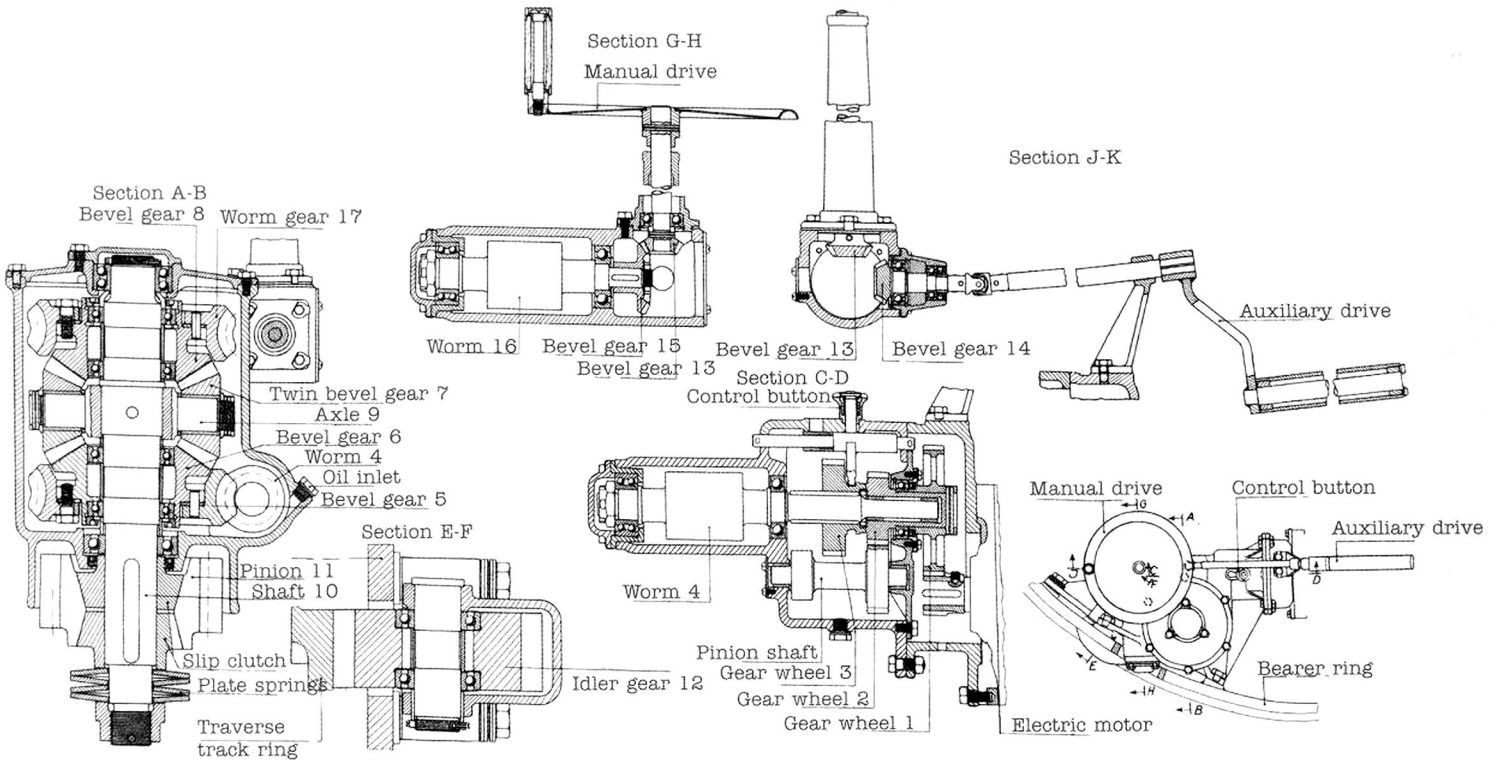
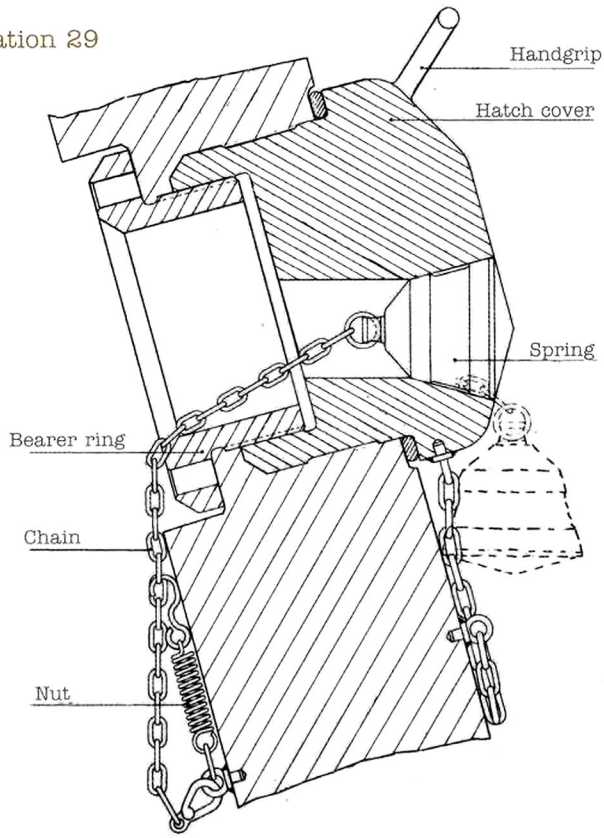


Illustration 29



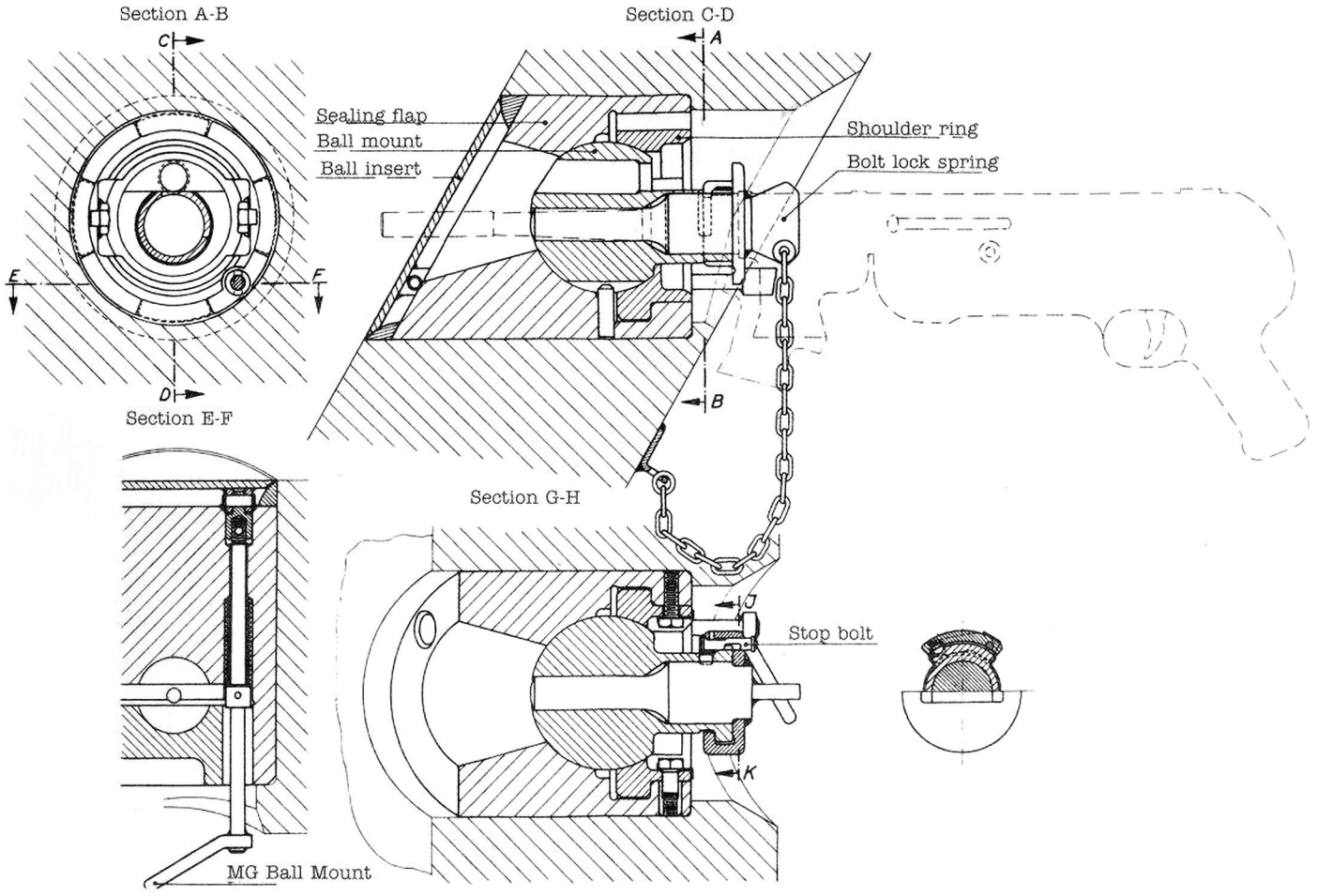

Section A-B
C
E
F
D
Section E-F
Section C-D
A
Sealing flap
Ball mount
Ball insert
Shoulder ring
Bolt lock spring
B
Section G-H
J
Stop bolt
K
MG Ball Mount

Illustration 31

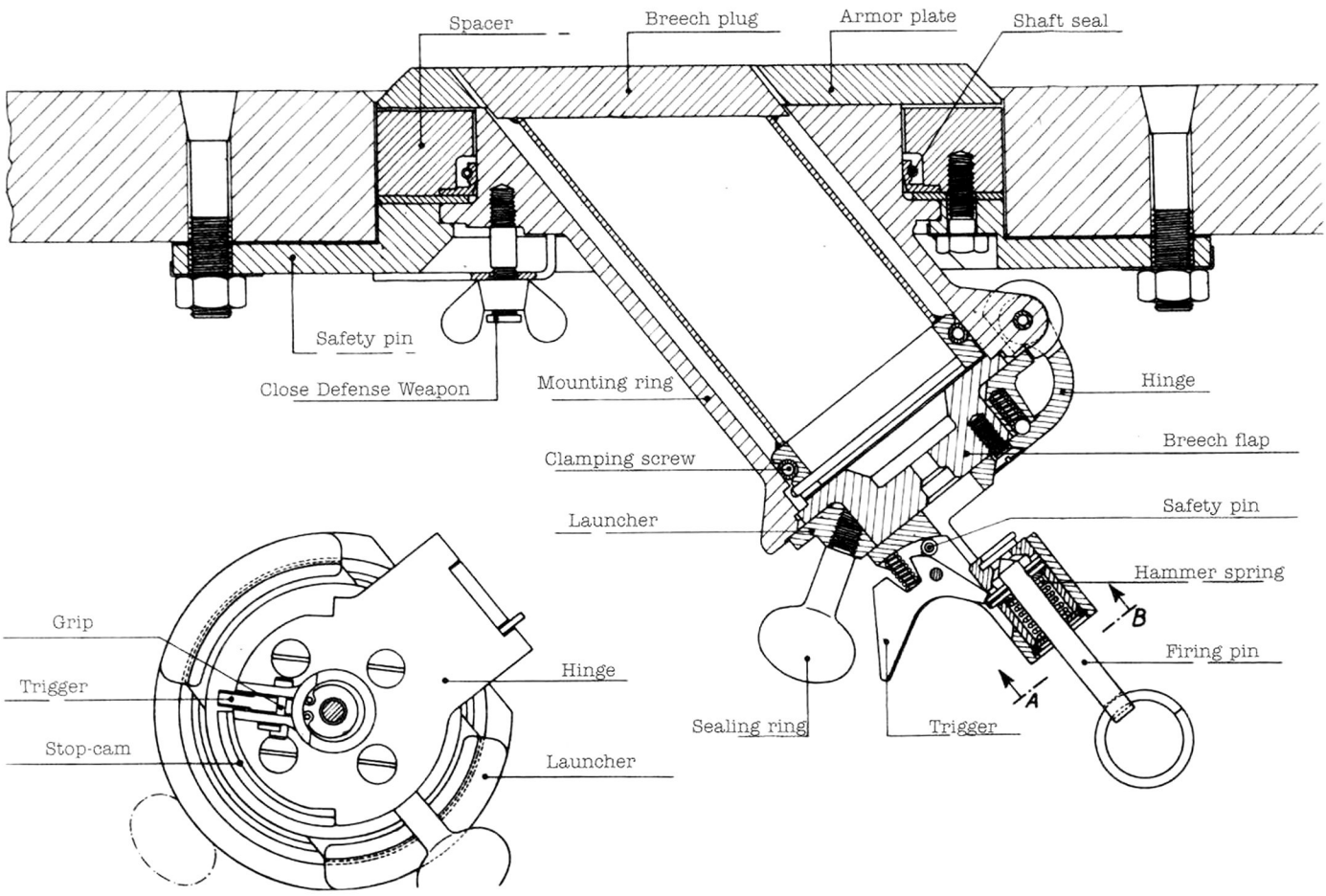
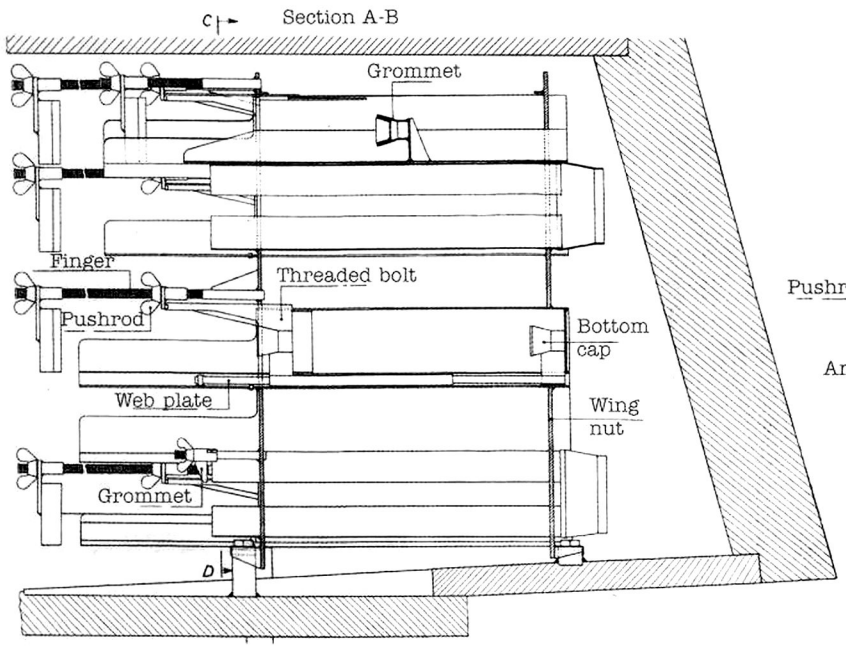
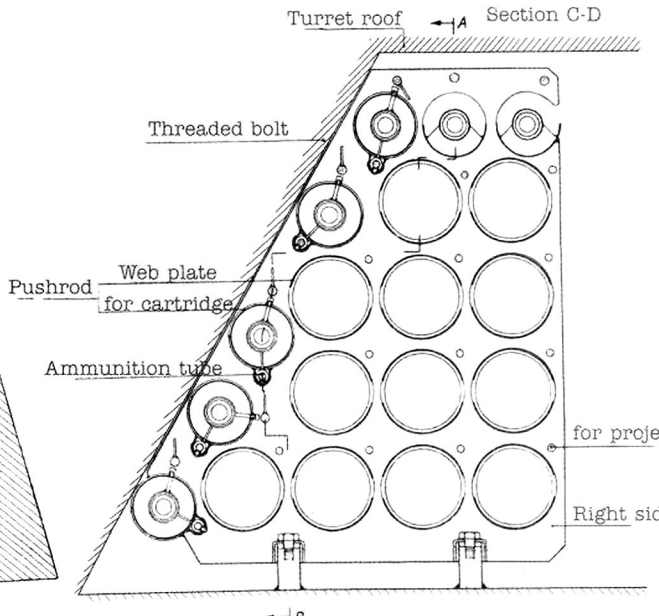


Illustration 33





128-mm ammunition stowage

Illustration 36

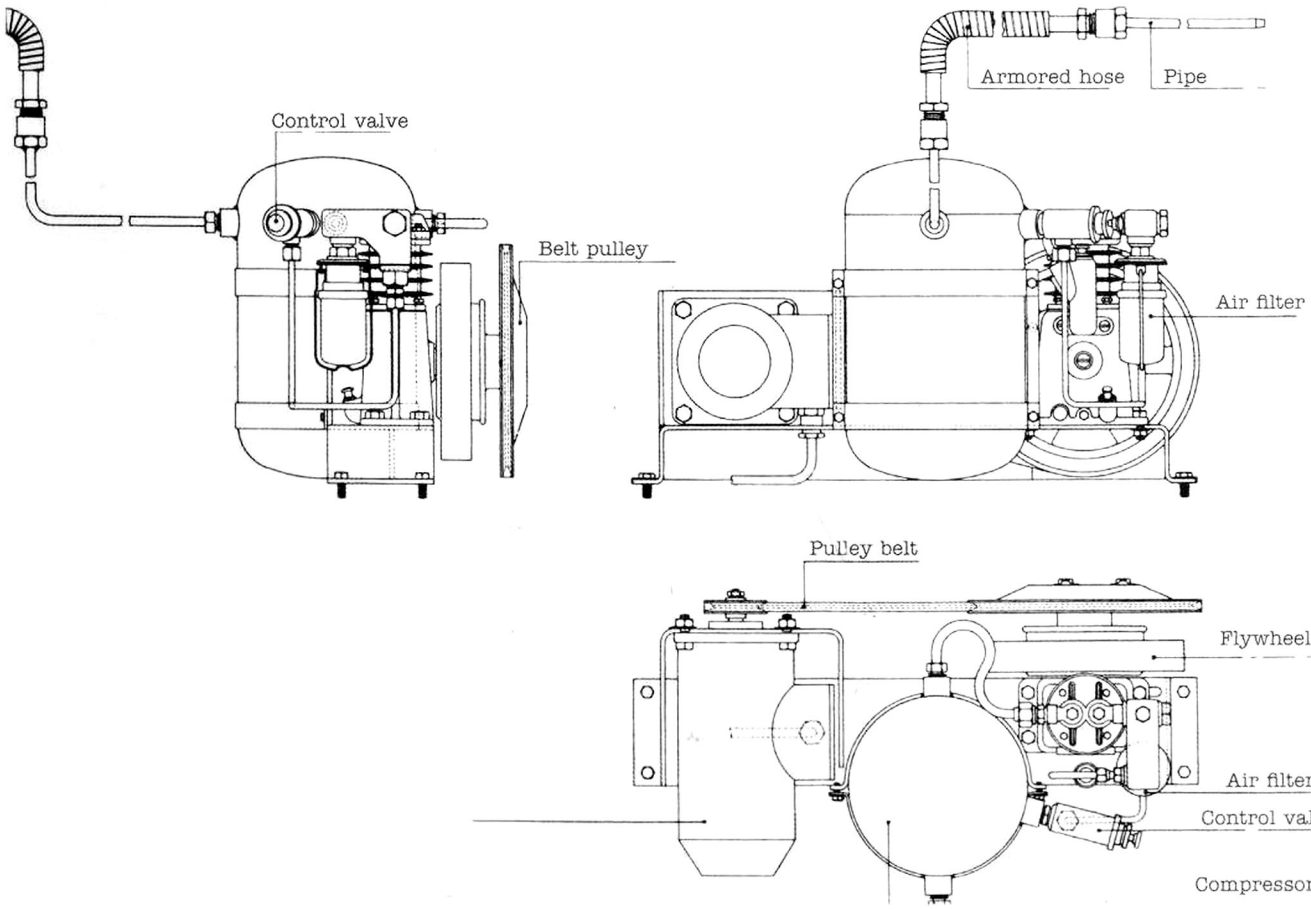


Bild 38

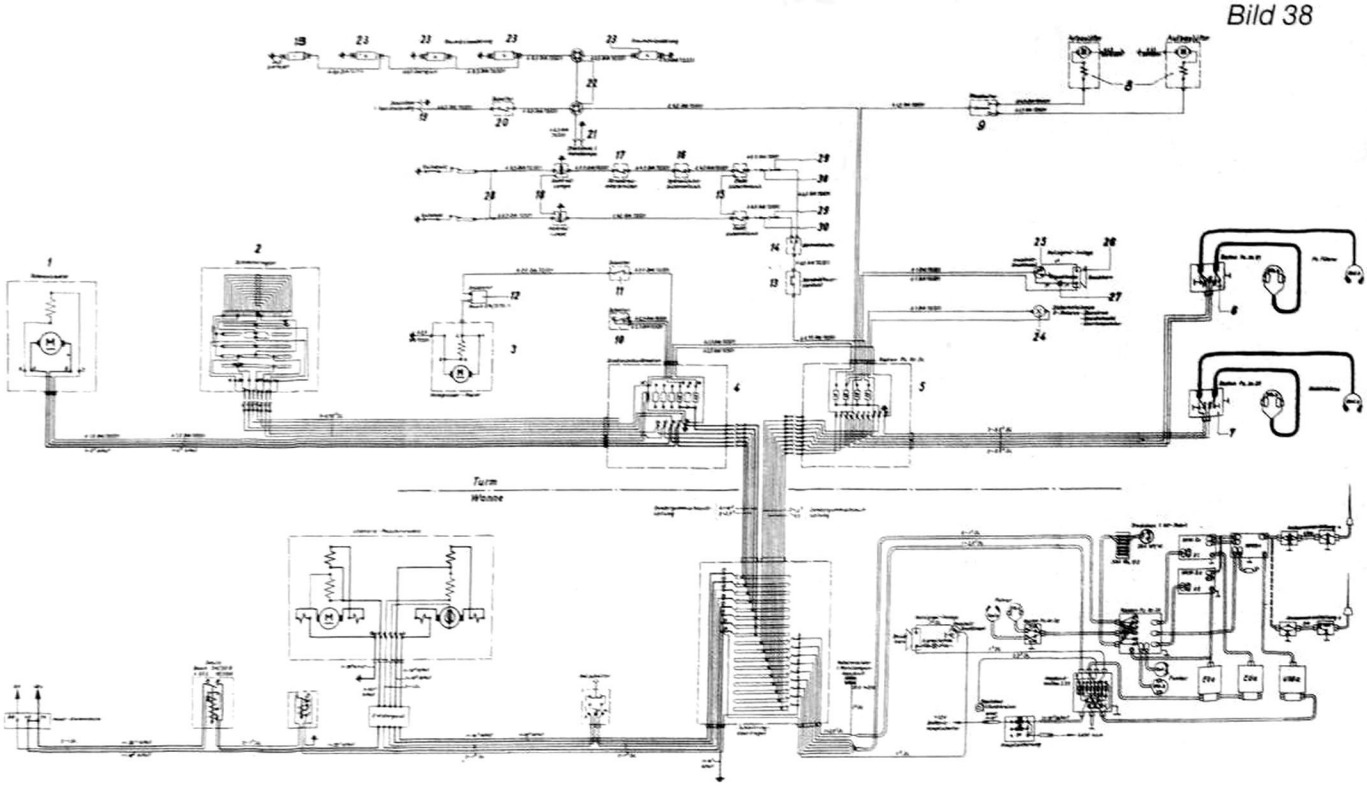


Bild 39

Abbildung 1

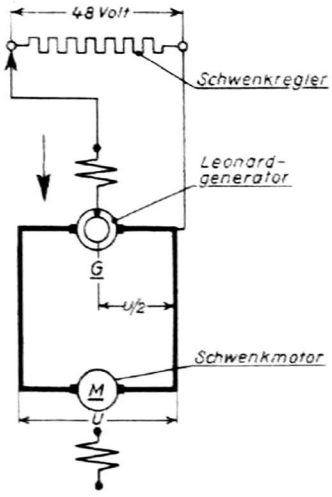


Abbildung 3

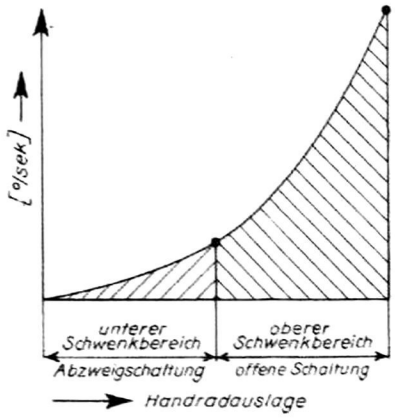


Abbildung 5

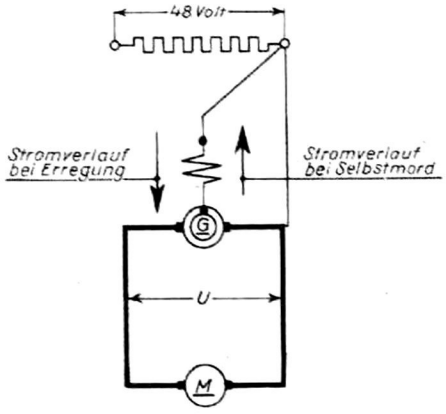


Abbildung 4

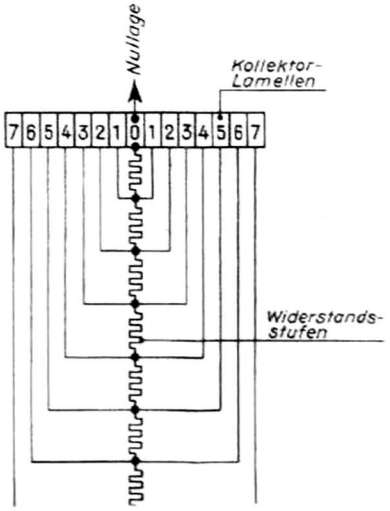
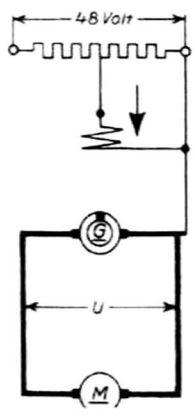


Abbildung 2



Schaltskizzen

Maus Development Timeline

Date	Development
22 March 42	Order for 100-ton tank to Porsche
13 May 42	120-ton tank with L/60 or L/72 gun
4 June 42	1st drawing of Porsche K 3381, mobile fortress possible
17 June 42	2nd drawing of Porsche K 3382
23 June 42	Check if thicker armor necessary and 150 mm L/37 or 105 mm L/70 gun
17 July to 3 Dec. 42	Work on P 1000 (Ratte) at Krupp
28 Oct. 42	3rd drawing of Porsche K 3384
14 Nov. 42	4th drawing of Porsche K 3385
3 Dec. 42	No 2nd turret on Maus tank, prepare navy plates and test 150 mm + 127 mm + 128 mm guns
7 Dec. 1942	130-ton Maus project
18 Dec. 42	Tigermaus reduced from 155 to 130 tons
31 Dec. 42	Tigermaus 130 tons
1 Jan. 43	5th drawing of Porsche K 3387
18 Jan. 43	Mäuschen, start of production, 130,000 tons of raw materials calculated
26 Jan. 43	KwK 128 mm L/55 is the longest possible barrel length
20 Feb. 43	Pre-production series order, 6 hulls and 6 turrets, 10 per month, 120 altogether + 6 pre-production vehicles = 126 units
4 Mar. 43	Contract with Krupp for 120 128 mm guns
5 Mar. 43	Krupp Essen bombed
21 Mar. 43	Contract to Simmering for 5 special rail cars and option for 5 more
1 Apr. 43	New running gear and new tracks due to weight increase
3 Apr. 43	Krupp Essen bombed
10 Apr. 43	Horseshoe-shaped flamethrower armor r = 120 mm [4.72 in.]
10 Apr. 43	According to WaPrüf 4, WaPrüf 6 not in agreement with two-part ammunition
17 Apr. 43	Letter from Krupp regarding welding problems with gunnery trials model
17 Apr. 43	1 + 6 gun cradles to be manufactured, eighth cradle for firing tests
22 Apr. 43	1st wooden turret model complete
30 Apr. 43	Krupp Essen bombed—all documents and wooden turret model destroyed by fire
3 May 43	Krupp Essen bombed

5 May 43	Order increased from 120 hulls and turrets to 135 + 6 pre-production models = 141 units
7 May 43	Machine work completed on firing trials turret
10 May 43	1st firing trials hull completed
13 May 43	128 mm ammunition from 50 to 80 rounds, 75 mm ammunition from 200 to 100 rounds possible
14 May 43	Full-scale wooden model and a remote-control model displayed at Rastenburg
15 May 43	2nd firing trials hull welded
16 May 43	Start of work on simplified version of firing trials turret
17 May 43	2nd firing trials hull completed
20 May 43	Firing trials turret completed and immediately sent to Kummersdorf proving grounds
20 May 43	Decision as to separate or cartridge ammunition made in Meppen
21 May 43	Discussion of turret design and deletion of fixed MG 151 anti-aircraft gun
25 May 43	Firing trials turret and hull arrive at Kummersdorf proving grounds, cannot be unloaded
25 May 43	Firing trials material diverted to Hillersleben proving grounds
27 May 43	Discussion about loading and hull dimensions
27 May 43	Krupp Essen bombed and second wooden model destroyed by fire
10 June 43	6 test tanks are fitted with Draeger gas defense system
10 June 43	Question concerning halting of Maus production by WaPrüf 6 not answered, instead order increased from 120 to 135 units!
19 June 43	Firing trials using Maus models at Hillersleben proving grounds
23 June 43	Evaluation of firing tests on hull and turret
24 June 43	Flamethrower abandoned
28 June 43	182 Stk. 75 mm shells are now accommodated in the hull.
30 June 43	100 Stk. 75 mm and 25 Stk. 128 mm shells are now accommodated in the wooden turret model. Turret now 52 instead of 51.5 tons.
1 July 43	Production reduced from 10 to 5 units per month.
7 July 43	Hull shell completed.
25 July 43	Krupp Essen bombed and production halted.
3 Aug. 43	Contract reduced from 135 units to 58 hulls and turrets. Date changed to September 3, 1943.
17 Aug. 43	Kugelfischer Schweinfurt bombed.
35 Aug. 43	Army Ordnance Office; just 30 hulls and 30 turrets to be completed.
14-29 Sept. 43	Meppen: 75 mm gun adjustment fire completed 431.8 m/s [1,417 ft/s] with tolerance +4.2 and -1.4 m/sec [13.8–4.6 ft/s].

26 Sept. 43	Hull Number 1 on road to Berlin on heavy transport wagon.
30 Sept. 43	Inquiry: stationary turret possible?
30 Sept. 43	Electric motors and generators from Siemens to Alkett.
7 Oct. 43	Instead of 24 shells, now 28 projectiles and 24 cartridges in turret.
9 Oct. 43	Only 30 tanks are to be assembled by Alkett, first hull not yet there.
14 Oct. 43	During bending of turret face, armor thickness reduced from 220 to 210 mm [8.66 in to 8.27 in.] in the middle, in places to 205 mm [8.07 in.].
14 Oct. 43	Kugelfischer Schweinfurt bombed.
27 Oct. 43	Armaments Ministry: just one Maus is to be completed—halt in Maus production.
29 Oct. 43	Guderian at Alkett with Porsche engineer Zadnik.
3 Nov. 43	Sending of the third hull from Krupp to Alkett stopped.
3 Nov. 43	Experiments with 128/105 mm discarding sabot round at Meppen.
8 Nov. 43	Order for MG 34s reduced to enough for 3 turrets.
9 Nov. 43	Order for loading swing arm, supposed to ease the task of loading shells with two-part ammunition (similar to Pak 43 Skoda).
9 Nov. 43	Attachment of turret weight finalized.
10 Nov. 43	1st batch total of 1,000 rounds: 500 Spr. L/4.5 and 500 Pzg. 43 (with cap).
10 Nov. 43	Order for 58 hulls and 58 turrets stopped.
11 Nov. 43	Krupp to OKH: number reduced from 6 to 2 hulls, but as third hull is complete, is it possible to increase number to 3.
11 Nov. 43	Alkett provides welder for completion.
12 Nov. 43	128 mm powder experiment with Barrel 3 on November 23-24, 1943.
12 Nov. 43	OKH to Krupp: actually reduced from 6 to 2, but as third hull finished total revised to 3; store hull in factory.
12 Nov. 43	Order reduced from 6 prototype turrets to 1 prototype turret.
16 Nov. 43	Firing tests with 128 mm gun using various shells in Meppen until November 18.
17 Nov. 43	Info to OKH: the MG 42 for the wooden model destroyed by fire.
17 Nov. 43	OKH: 6 reduced to 3 hulls and 3 turrets, the 8 complete guns continue, also the 58 guns and 9 barrels.
18 Nov. 43	Two-part ammunition powder length reduced from 920 to 820 mm [36 in to 32.3 in.].
19 Nov. 43	Design of smaller turret (Maus II) by Obering. Hendel of Krupp with sloped face, two guns one above the other.
24 Nov. 43	OKH to Krupp: as the order for 6 turrets has been reduced to 1, just 1 gun is necessary.
26 Nov. 43	Accuracy check Meppen firing range.

9 Dec. 43	Take parts from the 128 mm KwK for PiK 44 (Jagdtiger) for the vertical Zeiss 34 1110 in the 1-meter range finder.
10 Dec. 43	Krupp: arrival of 3 cast parts (e.g., gun mantlets) for turret, Krupp desires contract for 3 hulls.
10 Dec. 43	Request from Krupp: request for 3 units, as 3 hulls and 3 turrets are almost complete.
22 Dec. 43	KwK 44 comparative temperature firing at Meppen.
24 Dec. 43	Maus 205/1 ready to begin driving and initial tests.
4 Jan. 44	L/5 high explosive shell tested in Meppen.
6 Jan. 44	Confirmation of contract reduction by OKH.
14 Jan. 44	Maus 205/1 in Böblingen (numerous photos).
31 Jan. 44	Maus 205/1 first test drive in Böblingen (film).
7 Feb. 44	Welding work on second hull idled for 14 days, then sent to Böblingen.
17 Feb. 44	Remaining Maus parts at Krupp sent to "Forest Position" in Meppen (connecting track 3500).
10 Mar. 44	Maus 205/2 unloaded from the train in Böblingen by Maus 205/1.
14 Mar. 44	Maus 205/1 test report complete.
16 Mar. 44	Maus 205/1 bogged down in swamp.
25 Mar. 44	Krupp: 7 hulls and 7 turrets already manufactured.
27 Mar. 44	Krupp Essen bombed.
21 April 44	Krupp delivers prototype turret, but it is not accepted.
24 April 44	Bill for 16,391.25 RM for the wooden turret model (made by Alkett).
4 May 44	Acceptance firing trials by 128 mm KwK in Meppen.
4 May 44	Minor damage to turret in Böblingen. Mounting follows in three weeks.
7 May 44	Cradle with trestle and installed 128 mm barrel No. 29, recuperator 30, and elevating gear to Meppen.
7 May 44	128 mm KwK 44 sent to Böblingen.
8 May 44	State railway headquarters report about the three proven special wagons.
16 May 44	To May 19, experiments at the firing range in Meppen concerning armor piercing and high explosive charge firing (?).
1 June 44	Oberstltn. Müller WaPrüf 6: short briefing to senior officers.
3 June 44	Start of development of the E-100 from the Tigermaus.
7 June 44	Trials in Böblingen until June 16.
8 June 44	Prototype turret mounted on Maus 205/2.
11 June 44	No inspection with Guderian.
13 June 44	Conference in Meppen: muzzle velocity reduced from 925 to 905 and 3,600 kp/cm² [51,204 psi] on account of life of the 128 mm KwK 44.
22 June 44	Testing of Maus 205/2 (numerous photos).

23 June 44	Testing until July 2, 1944, 59 75 mm rounds in hull and 26 in turret / 43 128 mm rounds in hull and 28 in turret.
27 June 44	Wrong revolving periscope fitted (90º instead of 60º).
27 June 44	Process of 11/19/1943. 40-ton cast steel parts are to be scrapped in the Gruson factory in Magdeburg.
28 June 44	128 mm PaGr. 43 - first batch of 500 rounds completed.
6 Jul. 44	All development work on super-heavy vehicles halted.
7 Jul. 44	Despatch of 68 rounds of 128 mm ammunition half/half (one combat complement).
10 Jul. 44	Test Maus 205/2 until 07/17/1944.
18 Jul. 44	Bill for one complete turret 165,000 RM.
18 Jul. 44	Bill for the 6 hulls 6 x 180,000 RM = 1,080,000 RM
19 Jul. 44	Krupp fitters are to complete turret.
24 Jul. 44	New TRbl.F delivered to Porsche workshop.
25 Jul. 44	24 rounds PzGr. 43 soft + blank to the Porsche workshop in Böblingen.
25 Jul. 44	6 stopped hulls, but 2 already at Alkett (third hull = 95%, 4th hull = 70%, 5th and 6th hulls = welded).
28 Jul. 44	The second batch of 500 128 mm PzGr. 43 completed in Meppen.
31 Jul. 44	Confirmation of the scrapping of four hulls (fourth to seventh).
1 Aug. 44	Assembly of additional 128 mm PzGr. 44 ammunition.
4 Aug. 44	Test Maus 205/2. Criticism of Krupp for continuing removal of the turret as 205/2 is undergoing an engine change.
10 Aug. 44	Scrapping tender.
18 Aug. 44	Order for prototype turrets reduced from 6 to 1.
19 Aug. 44	Krupp: halt work on Maus 205/2, return fitters.
1 Oct. 44	Installation of the MB 517 diesel engine in Maus 205/2 and both Maus tanks to Kummersdorf Proving Grounds.
20 Jan. 45	WZF 1 and 2 receive angled telescopic sight.
20 Apr. (?) 45	Maus 205/2 blown up in Hindenburg Square in Wünsdorf.
20 Apr. 45	Maus 205/1 blown up on Firing Range West.
4 May 46	Maus 205/1+2 arrives at Kubinka proving grounds.

Bibliography

Boelcke, Willi A., *Deutschlands Rüstung im Zweiten Weltkrieg, Hitlers Konferenzen mit Albert Speer 1942-1945*. 1969, 68, 97, 119, 134, 136, 139, 192, 205, 211, 215, 258, 301, 396.

Breyer, Siegfried. *Marine-Arsenal S Bd. 6, Die Panzerung der deutschen Kriegsschiffe 1920–1945*.

Boschen, Lothar and Jürgen Barth. *Das große Buch der Porsche-Sondertypen und Konstruktionen von 1931 bis heute*. 1984, 138.

Fleischer, Wolfgang. *Die Heeresversuchsstelle Kummersdorf Band 1 und 2*. 2000, 140.

Fleischer, Wolfgang. *Gepanzerte Feuerkraft*, 78, 91, 95, 98, 107.

Fleischer, Wolfgang. *1000 Panzer und Militärfahrzeuge*, 124.

Forty, George. *Die deutsche Panzerwaffe im Zweiten Weltkrieg*, 142–144.

Guderian, Heinz. *Erinnerungen eines Soldaten*. 2003, 252, 256, 271, 272, 282.

Kaiser, G. and B. Herrmann, *Vom Sperrgebeit zur Waldstadt*.

Koch, Fred. *Panzer gegen Panzer*. 2003, 55, 109.

Speer, Albert. *Spandauer Tagebücher*. 2005, 59–60.

Lentz, Thomas J. and H. L. Doyle. *Panzer Tracts No. 6-3, Schwere Panzerkampfwagen Maus und E 100*.

Müller, Peter. *Ein Genie unserer Zeit*. 1965, 171, 174.

Osteroth, Reinhard. *Ferdinand Porsche, Der Pionier und seine Welt*. 2004, 248.

Quint, Herbert. *Porsche, Der Weg eines Zeitalters*. 1951, 124.

Pawlas, Karl R. *Waffenrevue Nr. 16-20 und 108*.

Pawlow. Superschwerer Panzer "Maus."

Porsche, Ferry and Günther Molter. *Ferry Porsche – Mein Leben*. 2004, 135–142.

Porsche Museum. *80 Jahre Pionierleistungen – Porsche Engineering*

Schulze, Lothar. *Spurensuche Band 9, Der Kessel Halbe-Baruth-Radeland, der Durchbruch zur Armee Wenck im April 1945*, 27.

Spielberger, Walter J. *Spezial-Panzerfahrzeuge des deutschen Heeres*. 1977, 41–63.

Spielberger, Walter J. and Doyle, *Der Panzerkampfwagen Panther und seine Abarten*.

Spielberger, Walter J. and Doyle, *Der Panzerkampfwagen Tiger und seine Abarten*.

Spielberger, Walter J., Doyle and Jentz, *Schwere Jagdpanzer*, 127–141.

Trojca, Waldemar. *Deutsche geheime Panzerprojekte*. 2004.

"Die Abenteuer der Maus in der UdSSR" in the magazine *Panzer*.

"Kreuzer und Linienschiffe für den Durchbruch" in the magazine *Panzer*.

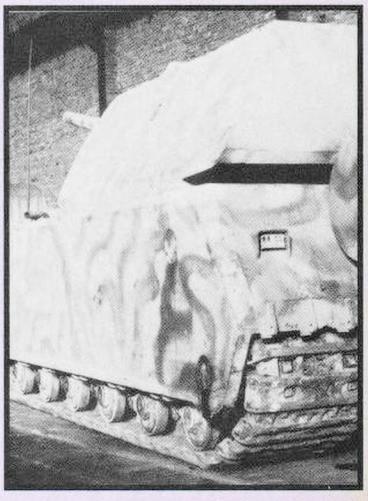
Photo Credits

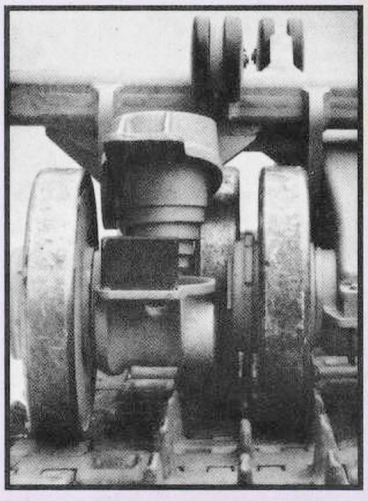
Porsche Historical Archive ..... 195 photos and documents
Tank Museum Bovington Archive ..... 9 photos
Mercedes-Benz Classic Archive ..... 5 photos and documents
Bavarian State Library—Hoffmann Archive ..... 4 photos
Dr. Carls Aerial Photo Data Bank ..... 6 photos
Heiner F. Duske Collection ..... 35 photos
Wolfgang Fleischer Collection ..... 4 photos
Joachim Deppmeyer Collection ..... 2 photos
Matthias Hausmann ..... 4 photos
Michael Fröhlich ..... 20 photos

KAMPFPANZER MAUS

The Porsche Type 205 Super-Heavy Tank

In 1944 the Maus giant battle tank, weighing almost 190 tons, was supposed to help turn the Wehrmacht's fortunes of war on the Eastern Front. Just two prototypes of this monster were delivered, for its undeniable advantages—tremendous firepower and virtually impenetrable armor—were outweighed by the disadvantages of its slowness, excessive use of materials in construction, and fuel consumption so high that it was, by that time, far beyond the Germans' ability to supply. With this volume, Michael Fröhlich continues the legendary Spielberger series and delves into one of the most curious military vehicles produced by Germany—the Maus super-heavy tank. For the first time, this book tells the complete story of this vehicle, including its inner workings, accompanied by many previously unpublished illustrations. But that is not all: the book includes another novelty, the complete operating instructions for the tank's crew!





9 780764 350788
ISBN:978-0-7643-5078-8

BK1063704